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VOLUME II AUGUST, 1909 NUMBER 8

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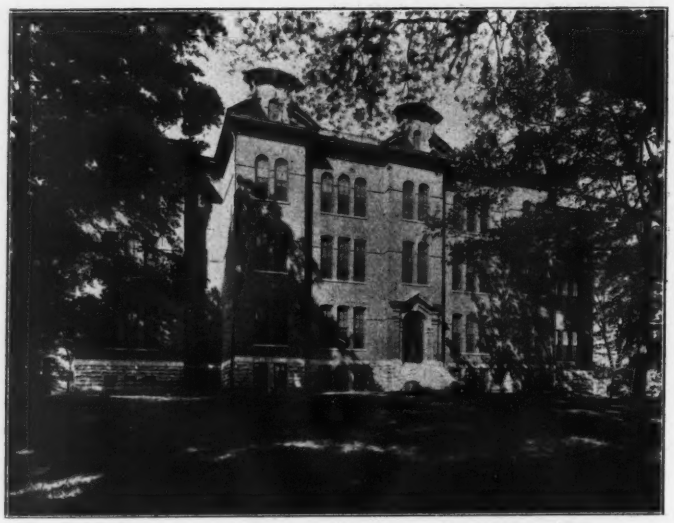

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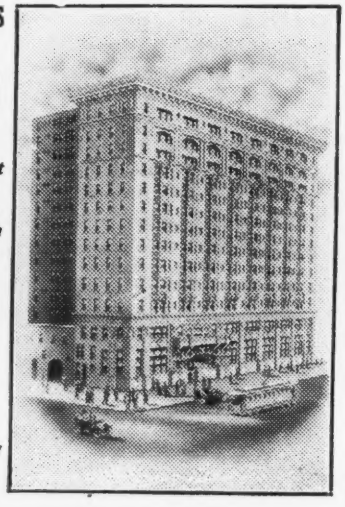

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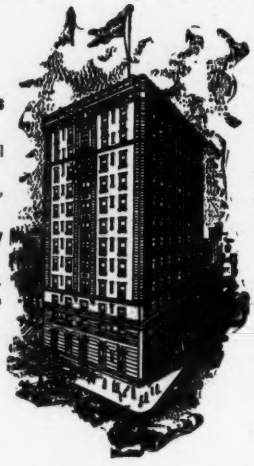

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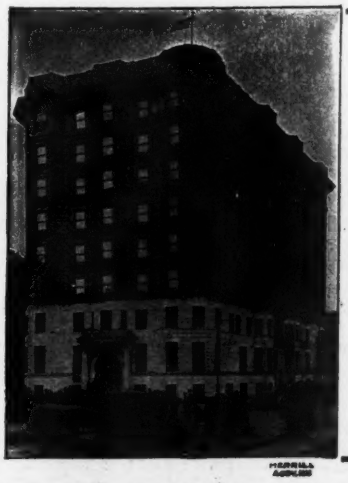

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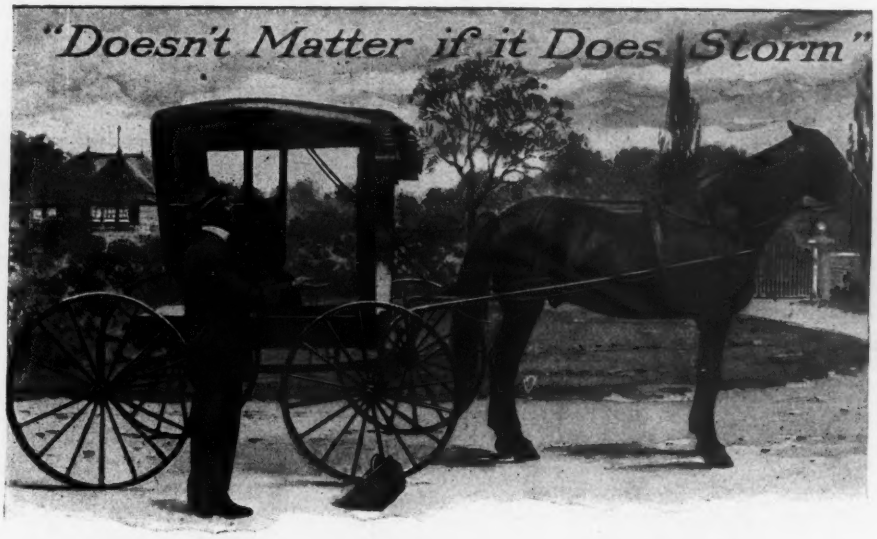

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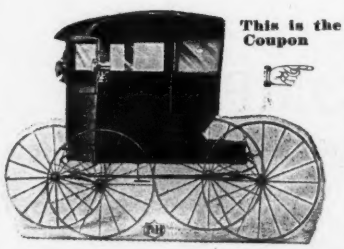

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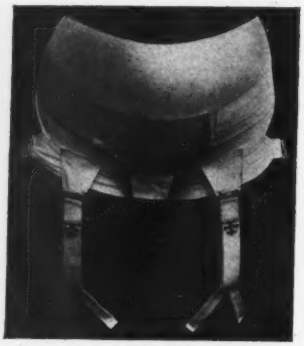

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SOUTHERN MEDICAL JOURNAL

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LABORATORY METHODS IN THE DIAGNOSIS OF TYPHOID FEVER

BY E. G. WOOD, M.D., C.M., Nashville, Tenn.

So variable is typhoid fever in its onset and throughout its course that quite a considerable percentage of the cases do not conform to what has unfortunately been recognized by many practictioners as a definite clinical type; especially is this so in Southern climates. The case may throughout be so atypical that it may be impossible to clinically recognize it as typhoid fever. It may be called bilious fever, malaria, etc., until suddenly the physician finds himself face to face with intestinal hemorrhage or perforation. Even in ordinarily well-marked cases the diagnosis is admittedly very difficult, if not impossible, in the first few days.

Fortunately in the vast majority of cases the laboratory enables us to arrive at a definite diagnosis, and in few diseases is its value as a diagnostic agent more striking.

The laboratory methods of value in diagnosis are: (1) the diazo-reaction, (2) the Widal serum test, (3) the determination of the presence of typhoid bacilli in the blood or secretions.

I. Ehrlich's Diazo-Reaction in the Urine.

Two solutions are necessary: (A) A saturated solution of sulphanilic acid in a 5 per cent solution of hydrochloric acid, (B) a half per cent solution of sodium nitrite. Both solutions should be fresh.

Add to the urine in a test-tube an equal quantity of A; then add three drops of B and shake until a froth forms. Render freely alkaline with ammonia. If the mixture becomes an intense red and the foam a brilliant rose-red the reaction is positive. Unless the rose-red color appears in the foam the result cannot be accepted as a positive reaction.

Value.—This reaction is said to never occur in health and very rarely in non-febrile diseases. It is present in the great majority of typhoid fever cases, some writers say almost constantly; McCrae says 61 per cent of his series of cases. It cannot, as a rule, be demonstrated before the fourth day or after the third week, and McCrae states that where from excessive water ingestion the urine is very dilute it is often absent.

The reaction is present in measles and acute tuberculosis, and it is said to have been occasionally observed in malaria.

After considerable experience with this test in typhoid fever one is inclined to consider that with fresh solutions a positive reaction obtained in a suspicious case of fever is of decided value. Unfortunately for early diagnosis it rarely occurs before the fourth or fifth day, and its appearance may be delayed into the second week. In its favor is the fact that the test is a simple one that requires no expert and no special apparatus.

II. Widal Reaction.

No attempt will be made to describe the technique of the Widal test, as a full description can be found in any text-book on medicine.

The Widal reaction has established itself as a test of undoubted value in the diagnosis of typhoid fever and in the hands of an expert a positive finding is well-night conclusive. This reaction is said to be present in over 95 per cent of cases of typhoid fever while its occurrence under other conditions is

so rare as to be of little importance in diagnosis.

While this agglutination phenomenon is seen in nearly all cases of typhoid fever it rarely appears before the end of the first week and its appearance may be delayed into the third or fourth week or even into convalescence. Again the reaction usually disappears within a few weeks, but it may persist for months or even years. The long persistence is usually attributed to the presence of typhoid bacilli somewhere in the body, most probably in the gall-bladder or in the urinary bladder.

Mention should be made of the *macroscopic* method of making the serum test. Dead cultures for use with this macroscopic method are now made by pharmaceutical laboratories and explicit directions are given which will enable any physician to employ this test. In Germany a suspension of dead cultures, known as Ficker's "typhus diagnosticum" is sold for this purpose.

This method depends on the fact that when the agglutinative serum is properly diluted and added to the culture suspension in the test-tube the organisms are precipitated leaving the supernatant fluid clear. The reaction is considered positive if there is complete precipitation with a 1 to 50 dilution within 24 hours.

This method is simple, requires no expert knowledge and no microscope is necessary. It is generally considered to be quite as accurate as the microscopic method and, therefore, on account of its simplicity of greater value and of wider utility.

III.—The Determination of the Presence of Typhoid Bacilli in the Blood.... or Secretions.

Typhoid bacilli have been demonstrated in the blood of over 75 per cent of cases by Cole and others. The bacilli are usually found in the blood early in the attack, often days or even weeks before the Widal reaction is positive.

Typhoid bacilli have been frequently isolated in the stools and urine of typhoid patients, also in the rose spots and in the fluid obtained by puncture of the spleen.

The determination of the presence of typhoid bacilli in the blood, tissues or secretions of a typhoid patient is of great scientific interest and where the method can be readily carried out is of the greatest possible diagnostic value in obscure cases, especially in the absence of a positive Widal reaction. This method, however, requires the services of an expert and a laboratory and is beyond the reach of many practitioners at the present day.

Leucocyte Count.—In uncomplicated typhoid fever there is no leucocytosis; on the other hand leucopenia is the rule. Excluding the temporary and moderate leucotysosis that has been shown to follow a cold bath, the ingestion of food, etc., a high leucocyte count in typhoid fever is considered to indicate some complication and if found associated with suggestive symptoms, as of perforation for instance, its presence is accorded considerable value by many writers. To be of diagnostic value, however, several counts should be made at short intervals, which successive counts should show a rapid rise.

Personally one attaches but little value to the leucocyte count in connection with the complications of typhoid fever except as a confirmatory evidence, and then only when a distinct and rapid rise is known to follow previous counts.

In conclusion it is fair to say that the laboratory furnishes us invaluable aid in the diagnosis of typhoid fever, and that without its aid the early recognition of the disease is often extremely difficult, if not impossible. When positive, its findings are unequalled in value by any other method of diagnosis; on the other hand a negative report posesses little if any value and must not be relied upon to the exclusion of the clinical features of the case under consideration.

THE BACTERIOLOGY OF TYPHOID FEVER

BY WM. LITTERER, A.M., M.D., Nashville, Tenn.

The bacillus typhosus was first observed by Eberth and independently by Koch, in 1880, in the spleen and diseased areas of the intestine of typhoid cadavers. It was not until 1884 that Gaffky succeeded in isolating in pure culture and described the principal biological characteristics of this micro-organism. Since that time evidence has slowly accumulated that this organism is the cause of typhoid fever. At first difficulties stood in the way of the general acceptance of such a view, owing to the fact that in its behavior the organism did not conform in one important respect to Koch's law, viz., that it was not possible to produce typhoid fever in animals by feedings them with the bacilli, the natural mode of infection in man; nor was it possible by any mode of infection to produce the gross lesions of human typhoid. It is true that typhoid bacilli when inoculated subcutaneously or intraperitoneally will be pathogenic for many animals, such animals dying from septicemia. Later it was shown that animals under certain conditions, when their power of resistance had been reduced, could be rendered susceptible to infection, with the production of more or less chacacteristic lesions. Other bacteria, however, sometimes produce like lesions. Additional evidence of the causal relationsship of the germ to the disease was made manifest by the discovery of "Pfeiffers Phenomenon," and by the Gruber-Widal test, or agglutination reaction. Recently the long sought for third requirement of Koch's postulate has been successfully met by Grunbaum of Leeds, who succeeded in producing thoroughly characteristic typhoidal lesions in the chimpanzee by feeding with typhoid bacilli. Four were infected, two died of the disease, while the others were killed on the twelfth and thirteenth days. All showed typical typhoidal lesions. Further crucial evidence of its specificity is shown by the report of a number of cases in which pure cultures of the Eberth bacillus, swallowed with suicidal intent have given rise to typhoid fever in man. (Duflocy and Voisin).

Characteristics of the Typhoid Bacillus.—The micro-organism is usually about three times as long as it is broad, being about one-third as long as the diameter of a red blood cell. It is very actively motile, Gram negative, non-spore bearing, and grows either in the presence or absence of oxygen. The cultivation of the bacillus is quite easy. It grows readily upon all the laboratory media at both room temperature and at the temperature of the body. For further description of this micro-organism, see any reliable work on bacteriology.

Distribution in Nature.—The bacillus typhosus is by preference a parasite. Outside the human body it is found with great difficulty, particularly in water supplies. Only a few well authenticated instances have been recorded in which this germ has been found in water, soil, etc. The organism is very resistant to cold and can live for several months in ice, though the majority are destroyed in a few weeks. The duration of life in water is important, but it is not easy to say in any given water supply how long the bacilli may live. This apparently varies with the amount of movement, sun light and chemical com-

position of the water, as well as the number of saprophytic bacteria present. Laboratory experiments have shown that they can survive in sterile water for more than three months, and for possibly two or three weeks in unsterilized ground or surface water. In carbonated waters they can exist for about four or five weeks. Jordan, Russell and Zeit are of the opinion that the life of the specific germ in the water of flowing streams is of comparatively short duration. No multiplication of the typhoid bacillus under ordinary conditions takes place in water, even when a considerable amount of organic matter is present, but, on the contrary, there is a steady decline in the number of organisms as the time goes on. Even the evidence of any genuine multiplication in the soil is not convincing.

The history of typhoid epidemics indicates that air-borne infection is quite rare, since the bacilli soon die if dessicated, but if the interval be short they may be sufficiently virulent to be infective. The old view that typhoid fever may be contracted by the breathing of noxious gases, sewer air, etc., is erroneous; so far as known, the specific germ is never conveyed in this way. Volumes have been written concerning the role that milk, flies, oysters, uncooked vegetables, etc., play in the conveyance of this disease. Likewise, the chronic bacilli carriers have been the subject of much discussion in which the evidence seems to point to the fact that they are, next to water, the most potent facors in disseminating typhoid fever. It is not within the province of this article to discuss the above important points.

Typhoid Fever a Bacillemia.—Bacteriology has, in the past few years, greatly increased our knowledge of the occurrence of B. Typhosus in the body. Certain of the abdominal viscera were regarded as the usual site of the bacilli. Fraenkel & Simmons,[1] as early as 1885, succeeded in isolating the micro-organisms from the blood, but such a proceedure was then regarded as an unusual occurrence. The increased number of observations which showed the bacilli in various parts of the body suggested that they must occur frequently in circulating blood. Since the use of ox-bile as a culture medium, for the identification of the typhoid bacillus in the blood, as recommended by Conradi,[2] extraordinary success has resulted. It is claimed by a number of authorities that the specific bacillus could be recovered in every case of typhoid fever; especially is this true if the blood is withdrawn within the first few days of the disease. I can heartily concur in the above statements so far as my experience with nine cases goes. In every one of these the B. Typhosus was isolated from the blood on the first trial. In two cases, on the first day in which the patient took to bed, two on the second, three on the third, one on the fourth, and one on the sixth. I intend to collect many more cases so that I may arrive at absolutely definite conclusions. I am strongly of the opinion, however, that the ox-bile-blood culture method is a most valuable contribution to the early diagnosis of this diesase. Coleman[3] and Buxton, who have had a ripe experience in studying the bacillemia in cases of typhoid fever, state that the bacilli in the blood diminish in number as the disease progresses and finally risappear from it at or about the time the temperature falls to normal. In their first paper they expressed the opinion that in typhoid fever the earliest and principal seat of infection is in the blood, and that the disease should be regarded as a bacillemia. They have slightly changed their views as a result of work done on the absorption of the typhoid bacillus from the peritoneum and from the fact that in typhoid fever the lymph nodes and spleen contain such enormous numbers of bacilli. From this they conclude that in typhoid fever the bacillus first fidns its way from the alimentary tract to the lymphopoietic system, including the spleen, where it develops chiefly and from which it invades the blood

stream. Many observers think it doubtful that the bacillus multiplies in the blood, but rather that its presence there represents simply an overflow from the lymph organs. By this interpretation the existence of the bacillus in the blood does not constitute a true septicemia. Buxton calls attention to the relation of the bacillemia to the course and type of the disease. He is quoted as follows: "That in the earlier stages the bacillus invades the blood in greatest numbers; later, as the disease is approaching a favorable termination, the diminution in the number of bacilli in the blood is simply an index of less active development in the lymphatics and spleen." There appears then to be a definite relation in the evolution of typhoid fever between the symptoms and the bacillemia. The increasing intensity of the symptoms in the earlier period of the disease corresponds to the active growth of the bacilli. Then comes the stationary period, when the ratios of growth and destruction appear uniform. The steep-curve period corresponds to a diminishing bacillemia and defervescence to the complete disappearance of bacilli from the blood.

Types of Typhoid.—The bacillemia apparently bears no relation to the type or severity of the disease except in so far as regards the number of bacilli. The bacillus is found in the blood equally, but not with the same persistence, in the mild as in the severe cases, and in cases of short as well as of long duration. The bacilli are found in the blood of cases lasting only ten days. The importance of the definite establishment of the nature of these short-duration cases can scarcely be overestimated from the epidemiological standpoint. The Widal reaction has done much to clear up their diagnosis, but the final proof has remained for the bacteriological examination of the blood.

Relapse.—According to Coleman, Buxton and others a relapse means reinvasion of the blood with destruction of the bacilli which probably cause the symptoms of a relapse, but the underlying conditions which inaugurate active development of the bacilli after their growth has once been brought under control are unknown.

Blood Cultures Compared with the Widal Reaction.—The concensus of opinion is that the typhoid bacillus is always present in the blood before the Widal reaction develops, for the reason that endotoxins must be liberated before the agglutinins can be formed. Proof of this is shown by the researches of Hirsh,[4] Jochmann,[5] Buxton, Coleman and many others. Two hundred and twenty-three cases of typhoid were examined by Hirsh, Buxton and Coleman; fifty-five out of this number in which the typhoid bacillus was found in the blood, showed a negative Widal. Twenty-three were in the first week, twenty-six in the second week, and six in the third. It sometimes happens that a negative Widal is recorded in the third or fourth week. Again the reaction appears on certain days and then disappears entirely. In such cases blood cultures could very easily settle the question as to diagnosis. In eight of my nine cases the specific bacillus was isolated before the Widal reaction manifested itself. All finally showed the Widal reaction, varying from two to seven days after finding the bacilli in the blood.

The Widal Reaction, often spoken of as the Gruber-Wdial reaction, is without doubt of inestimable value in clearing up many obscure typhoidal like symptoms. Though not considered absolutely diagnostic when the reaction is present, still it is regarded as the most trustworthy test aside from blood culture that we have at our command. Cabot's collection of 5,978 cases gives a positive reaction in 97.2 per cent. A positive reaction was obtained before the eighth day in 93 per cent of 849 cases of typhoid fever. The more one studies the Widal reaction the more thoroughly convinced is he of its great value and its specificity. Several years ago many writers observed that in jaundice the Widal reaction would in many cases be positive. Quite a

number thought that possibly this would vitiate the diagnostic trustworthiness of the serum reaction. However, since we have come to recognize the importance and the frequency of typhoid infection of the biliary tract, and since we have learned of the occurrence of a primary typhoid cholecystitis and cholangitis, we have come also to think that these cases of jaundice are examples of typhoid infection, and that the Gruber-Widal reaction is of much importance in determining the nature of the icterus. In a number of cases of jaundice that have yielded a positive Widal reaction the typhoid bacillus has been isolated from the biliary tract at operation or after death; and since it has been determined experimentally that the bile as such has little if any tendency to cause agglutination of the typhoid bacillus, it is only reasonable to look upon a positive serum reaction in cases of jaundice as evidence of typhoid infection of the biliary tract.

Conclusions—(1) In every case of typhoid there is a bacillemia from the beginning of the fever to its defervescence.

(2) The blood culture method is the most valuable contribution to our knowledge concerning the early diagnosis of such a protean disease.

(3) The bacillus typhosus infects the lympho-poietic organs in which they develop in enormous numbers. Invasion of the blood stream takes place, where they are destroyed, liberating endotoxins.

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DIET AND PROPHYLAXIS IN TYPHOID FEVER

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I am greatly pleased that in arranging a symposium on typhoid fever the distinguished Editor of the Southern Medical Journal has given me the theme of diet and prophylaxis; because, in my opinion, the diet of the patient and the prevention of others from becoming infected are among the most important problems to the physician in the management of typhoid fever.

During the past few years the diet in typhoid fever has been discussed by many able men, and there is no question in medicine about which there are greater differences of opinion. The phyiscian may take his authority and follow him and he can get statistics to prove that almost any given diet is best for the typhoid fever patient. Many argue that milk is poison to typhoid patients, others that it should be practically the sole diet, and others that typhoid fever patients should be fed with as many food calories, and of as varied character, as in health. All of which goes to prove that the great majority of typhoid fever patients, in spite of the different diets given them, usually recover, and it also argues against any routine diet in the disease.

In dieting a typhoid fever patient it should be remembered that we have to nourish an individual, who has an illness which will probably last for several weeks, and that his strength and vitality should be conserved as much as possible. The diet which is suited to one may not be best for another, and the appetite and idiosyncrasies of the patient must be considered.

Aside from individual peculiarities, the pathological changes in the intestines, both anatomical and physiological, should guide us as to the amount and character of the food to give a typhoid fever patient. It is just as important to consider pathology in prescribing a diet as in giving medicine. It is manifestly unwise to give the same nourishment during the first week, which pathologically corresponds to the stage of hyperplasia of the lymph follicles in the intestines, when there is but little impairment of digestion, as in the third week, the stage of ulceration, when there is hyperpyrexia, with greatly decreased powers of digestion, absorption and assimilation, and when there is danger of hemorrhage and perforation. No physician would think of prescribing dilute hydrochloric acid, alcohol or strychnine during the first week or throughout an attack of typhoid fever, yet some of our most eminent authorities give the same diet during the entire four weeks of the average case. Some starve the patient from the beginning to the end of the fever, while others would overfeed him throughout the attack. In my opinion, the tendency of the times is towards harmful overfeeding of the typhoid fever patient, but from it we have learned that we can give a more liberal diet than was considered possible a few years ago.

Typhoid fever is usually divided into four pathological stages which correspond in a measure to the clinical division into four weeks, and it seems to me advisable to diet the patient accordingly. It is not possible, of course, to know exactly the pathological conditions in the intestines in any given case of

typhoid, but it is usually practicable to estimate the stage of the disease with sufficient accuracy to give the patient the proper diet.

In the first stage which is characterized by hyperplasia of the lymph follicles of the intestines, the powers of digestion are but little affected, and the patient should have a liberal diet, avoiding only those articles of food which are likely to disagree. During this stage the patient should have a diet which will provide him with almost as many heat calories as he ordinarily needs. He may be given soft-boiled eggs, scraped beef, finely chopped chicken, dry toast, corn starch or arrow-root, gelatin, milk (if it agrees), milk toast, frozen custard, ice cream, the soft part of oysters, or even white fish. It should be remembered that many typhoid patients do not seek meidcal advice during the first week of the attack, and they have eaten a general diet up to the time they consult a physician. Such patients should be placed on the diet indicated for the second week.

In the second week, in which clinically there are few symptoms except moderately high fever, and which is characterized pathologically by necrosis and sloughing, the diet should gradually be decreased and the scraped beef, soft-cooked eggs, chicken, fish, oysters and toast should be left off. During this stage the patient should be given albumen, milk (if it agrees), ice cream, frozen milk punch, egg-nogg, egg milk shakes, barley water, or barley gruel, perhaps strained oatmeal gruel and considerable quantities of milk sugar, which may be given in lemonade, sherbet, barley water and in milk or water.

During the third week, which corresponds clinically to the period of hyperpyrexia and pathologically to ulceration, and when there is greatest danger of hemorrhage and perforation, it seems to me advisable to cut down the diet very materially, and I believe milk should be given in small quantities, well diluted with lime water, plain or carbonated waters, or peptonized, if given at all during the third week of typhoid fever. Wilson and others have noted the presence of curds in the stomach and small intestines in autopsies on fatal cases of typhoid, and it appears probable that the curds of milk, as foreign bodies, can act as irritants to the ulcers, and possibly cause perforation or hemorrhage. It should be remembered that, during the height of inflammation and ulceration of the intestines, digestion is very greatly impaired, and that there is comparatively little digestion and absorption in the small and large intestines. It is therefore not only useless, but harmful, to give much nourishment of any kind that requires digestion or which may accumulate in masses in the intestines. Milk furnishes the finest possible culture medium for the pathogenic intestinal bacteria, and I believe that by giving milk in the third stage tympanites and diarrhoea are more likely to occur. Indeed, I am sure that I have seen tympanites and severe diarrhoea from giving milk at this stage, and both have subsided upon leaving it off and clearing out the curds from the intestines by means of enemata. The cases of typhoid in my practice in which hemorrhage and perforation occurred, there was marked tympanites, and in the majority of them there was diarrhoea. Milk may increase both tympanites and diarrhoea, and I reiterate that milk should be given with great caution during the third week of typhoid.

During this stage the diet should consist of food that requires very little intestinal digestion, and which provides as many heat units as possible. Albumen and the soluble carbohydrates, particularly milk sugar, and meat juices should be the principal food in the third week. Alcohol is useful in this stage, particularly when there is high fever, more because of its food value than because of its stimulating effects. The alcohol is absorbed directly from the stomach without digestion, and is burned as food, thereby preventing tissue waste. Each gram of alcohol furnishes seven calories of heat, or that equiv-

alent of energy in the body. Alcohol should be given in increasing doses during the third week, depending upon the degree of pyrexia or toxaemia, and upon the habits of the individual. If one ounce of whiskey be given every two hours it furnishes at least 1,000 food calories per day, and saves that amount of consumption of body fat and protein.

During the fourth week, the stage of regeneration, when the fever is subsiding and repair of tissue is taking place, and with it the beginning return of physiological functions of the intestines, the food should be guardedly increased. Milk may be given well diluted or pre-digested or in combination with some of the foods which modify milk and soften the casein. Barley water or oatmeal water may be added to the milk, and other articles of soft diet may be given.

During convalescence the greatest care must be employed in diet, but the patient should be given a sufficient amount of food that will leave little residue in the intestines. Scraped beef, very finely chopped steak, or mutton chop, may be chewed and the fibrous part rejected, milk may be given in increasing quantities, toast, soft-cooked eggs, custards, ice cream, meat jellies, tender chicken, fish, and two weeks after defervescence the patient may be given his regular diet.

We see many atypical cases of typhoid, and the diet must be regulated according to the severity of the attack. In the mild attacks and particularly the "short duration" type, which represents fully ten per cent of all cases, and in which the fever lasts from one to three weeks, the only symptom being fever, the diet should be liberal. This type rarely goes further than the stage of hyperlasia, and there being practically no danger from hemorrhage or perforation, the diet should be about that previously described for the first and second weeks.

In the prolonged cases with high fever, which are probably due to intercurrent relapses, the diet should be of diluted or modified milk, albumen, milk sugar, meat juices or broths if they do not produce diarrhoea, barley water, and alcohol. In the prolonged asthenic cases it is best not to give too much alcohol, but after the fourth week to feed the patient more liberally, unless there is diarrhoea or tympanites, or other evidence of improper digestion. I do not believe that the diet has anything to do with the relapses in typhoid fever, except in cases of gross dietetic errors. Seven to ten per cent of cases of typhoid will have relapses or reinfections, even if on strictly liquid diet.

In the diet of typhoid water is of great importance, and the patient should be urged to drink large quantities. At the Johns Hopkins Hospital the effort is made to have the typhoid patient drink at least a gallon of water per day, McRae's idea being that the diuresis which follows the ingestion of large quantities of water eliminates toxins and and thereby decreases fever and lessens the severity of the nervous symptoms. If there is any tendency to myocarditis or if there is dilatation of the left ventrical it is best not to overload the heart with such a volume of water, but ordinarily I believe in giving the patient large quantities of water. It should be given every two hours during the day and three or four hours at night, whether the patient desires it or not. Water may be given in albumin water, lemonade, very weak tea, diluted grape juice, barley or oatmeal water. Milk sugar which, owing to the work of Shaffer and others, has recently been considered of great food value in typhoid, may be given in water.

Milk is used more than any other article of nourishment in typhoid fever, though there are some who think it very harmful. In discussing diet during the stage of ulceration I gave the objections to milk being used at that period of typhoid, but its effect should be watched at any stage. It certainly agrees with many patients, and unless it disagrees should constitute a large portion of the diet,

except during the third week. From one to two quarts a day may be given unless there are digestive disturbances which may be increased by giving it. Milk as an article diet in ileocolitis of infancy and childhood is condemned by most pediatrists, and in typhoid we usually have a sewere inflammation of the intestines so that milk should be under suspicion as a diet at any period in typhoid, and particularly so during the height of the intestinal inflammation. If there is vomiting, diarrhoea or marked tympanites, milk should be, at least temporarily, discontinued.

Buttermilk is used quite extensively in typhoid, and though not so nourishing, is more easily digested than sweetmilk; but it is open to the objection that undigested curds may be left in the intestines. Since Metchnikoff, in his interesting book, "The Prolongation of Life," announced his plausible theories regarding the powers of lactic acid bacilli to inhibit intestinal putrefaction, many preparations of the lactic acid bacilli for making "artificial" buttermilk have been placed on the market, and their manufactors have made extravagant claims of their value in typhoid, as in all other conditions. The so-called "artificial" buttermilk has no advantages over that obtained from churning "sour" or "turned" sweetmilk, and "buttermilk" therapy in typhoid, as in other conditions, is only in the experimental stage.

The proprietary preparations of peptones, predigested beef, etc., since they contain but little nourishment may be left off with benefit to the patient, except as temporary substitutes when the ordinary diet disagrees. Their principal value is from the alcohol which they contain, and good whiskey or brandy is preferable. These foods which contain beef extracts will sometimes cause diarrhoea. Panopepton is probably the best and most nutritious of the proprietary foods.

Prophylaxis.

"For every case of typhoid fever someone should be hanged," is an oft-repeated statement which is not founded on facts, but it calls attention to the responsibility of physicians in treating typhoid. It is just as much the duty of the physician to prevent disease as to treat the sick. Indeed the prevention of disease is the highest and noblest art in our profession, and when physicians, and the laity, realize that typhoid fever is a highly infectious disease, and so become imbued with the importance of preventing its spread, then will we hope to make it one of the rare diseases.

I fear that the majority of physicians are too negligent in the prophylactic management of typhoid fever. It would be better for humanity if physicians were sent for in cases of typhoid fever to prescribe methods of preventing others from contracting the disease and let the patient go without medicine, than to do as is frequently done by physicians—*i. e.*, dose the patients with medicines, which in the majority of cases are not indicated, and make no effort to find the source of the infection, nor use any methods to prevent its spread. That is a very sensible law in North Carolina which makes it a criminal offense, punishable by fine or imprisonment, for the neglect of a physician to instruct the attendants regarding the methods of disinfecting the discharges of a typhoid fever patient. If a physician has not the moral courage to do his duty in preventing disease there should be laws to "haud the wretch in order."

In discussing the prophylaxis of typhoid, I shall take the position that the place to begin is with the patient, because there you have a known focus of infection.

In every case of typhoid fever, the physician should provide the nurse with written directions regarding the disinfection of the excreta, and the precautions for preventing others from becoming infected, and at each visit, it is his duty to see that these instructions are carried out. In many cities and some states, and it should be done everywhere, the health authorities provide physicians with printed instructions, regarding the prophylactic man-

agement of typhoid, which are given to the nurse or family of the patient.

The typhoid fever patient should be isolated, as we do other infectious diseases. In a number of European hospitals the writer was impressed with the care with which typhoid patients were isolated—always in separate rooms and in several hospitals, constructed upon the barracks plan, the typhoid fever patients were given separate buildings. Since we know that contact infection is one of the important means of conveying the infection of typhoid, the isolation of patients afflicted with that disease should be insisted upon.

The room of the typhoid patient should be well ventilated—fresh air and sunlight are more potent disinfectants than many of those sold on the markets. Window curtains, pictures and other hangings, carpets, rugs, and unnecessary furniture, which catch dust and hold the infection, should be removed from the room. Personal and bed linen, upon becoming soiled, should be immersed in an antiseptic solution before being taken from the room, and before use again should be boiled for not less than half an hour.

The excreta should be carefully disinfected. Simple immersion in an antiseptic solution is not sufficient to destroy the typhoid germs—it should be kept in contact with the solution for several hours. The bed pans and urinals should constantly contain a small amount of an antiseptic solution, and the discharge should be immediately placed in another vessel containing at least two parts of the solution to one of the feces. The feces should be thoroughly broken up and mixed with the disinfectant solution, and should so remain for at least four hours before being placed in the water closet, if the house is connected with the sewer. if not, it may be covered with dry earth at a place where the drainage cannot get into the water supply. Under no circumstances should the excreta of a typhoid patient be placed in a privy vault, or exposed to any place where it can be reached by flies, or by coming dry get into the atmosphere as dust. In other words, do not depend entirely upon chemical disinfectants to destroy all the typhoid bacilli in the discharges of any patient suffering with that disease.

Formalin (40 per cent formaldehyde) 1 tablespoonful to quart of water is probably the best disinfectant for faeces. Carbolic acid (3 per cent solution) preferably with from 3 to 5 per cent of common salt, or with a small quantity of a mineral acid, next to formalin, is probably the best chemical agent for destroying the germs in typhoid excreta, and has the advantage of being cheaper than the formalin.

The cresols, which occur as impurities or by-products in the manufacture of phenol, are more powerful germicides and less toxic to man than the carbolic acid, and since they are also cheap, are coming into general use. Creolin, which contains 10 per cent cresols held in solution with soap, is a very effective germicide when used in a 5 per cent solution. Lysol contains 50 per cent of cresols, with neutral potash soap, and in a 1 per cent solution is as powerful as a 5 per cent solution of carbolic acid. The crude carbolic acid, since it contains as an impurity the cresols, is preferred by some, who claim that it is not only cheaper but a more efficient germicide than either the pure carbolic acid or the cresol preparations.

Mercuric chloride is used perhaps more than any other agent for disinfecting typhoid excreta, and it is one of the most powerful antiseptics that we have, yet in disinfecting feces it is probably almost inert. It forms, upon the addition of organic matter, the albuminate of mercury, which coats over the substances and temporarily inhibits germ life, but it has very little powers of penetration. With feces it also forms the sulphide of mercury, which has very slight bactericidal properties, before it has time to have much effect in destroying the bacilli in the feces.

Hexamethyl enamine given internally, in

doses from 5 to 10 grains, every four hours, will completely sterilize the urine, and since in some cases of typhoid bacilluria the germs may be found in the urine for weeks after convalescence the urotropin should be kept up for several weeks after the patient's recovery.

Probably the best and most convenient chemical agent for disinfecting urine, after it has been voided, is mercuric chloride, which may be kept in solution, 1 to 1,000, and added to urine, in equal quantity, as passed. One teaspoonful of formalin added to half a pint of urine will completely sterilize it in a few minutes.

Physicians, after examining a typhoid patient, and nurses, after handling the patient's soiled linen, or the bed pans and urinals, should use great care in disinfecting their hands, particularly before taking food. Typhoid germs have been found under the nails for weeks after contact with a patient. Simply washing the hands is not sufficient—the space under the nails should be carefully cleansed, and the hands, after thorough washing in soap and hot water, should be bathed in an antiseptic solution, preferably a 1 to 1,000 solution of mercuric chloride, or 1 to 20 solution of carbolic acid. Those who are nursing typhoid fever, or who are constantly in the room with a case should change their clothing before coming in contact with others, and under no circumstances should a typhoid fever nurse handle the food of others.

After the death or recovery of a patient, the room should be disinfected as in other infectious diseases.

The cardinal principle in the prevention of disease, as in treatment, is to find the cause and remove it. The physician's first duty in being called to see a case of even suspected typhoid is to make careful search for the source of infection. He should make inquiry regarding the purity of the drinking water and milk supply, and as to the exposure of the patient to other cases of typhoid. He should examine the premises of the patient with particular reference to infection from flies, or contaminated food from other sources, and the possibility of typhoid bacilli carriers being responsible should be considered.

Unless the drinking water is of absolutely known purity it should be filtered and boiled in every house in which there is a case of typhoid and every one, in any city or town during an epidemic of typhoid fever of unknown origin, should drink only boiled or other water known to be free from infection.

In guarding against milk infection it is well worth while for every family to examine carefully into the milk supply. Dairies which supply milk to cities should be regularly inspected by efficient medical officers. Cows should not be pastured in lowlands upon which the sewage of cities, or even small towns, is drained. Milk vessels should always be washed in boiling water before being used. Milkmen should use great care in cleansing their hands and the udders of the cows before milking. In case of an epidemic of typhoid fever, or even with a single case in a family, it is best to pasteurize or boil the milk, and to protect it from dust and flies.

The proper disposal of the excreta of the typhoid patient will in a great measure prevent infection from dust. However, it should be remembered that the sputum of the typhoid patient may contain the Eberth's bacillus, and it should be burned or disinfected as we do in pulmonary tuberculosis.

Flies present a greater problem. Of course, if the excreta is disinfected and placed where flies cannot reach it, they cannot carry the infection; but every fly should be regarded with suspicion, because our neighbors, even at considerable distances from our homes, may not take any precautions in disinfecting the excreta of their typhoid sick. We should, therefore, screen with great care, our windows and doors, particularly in the rooms where food is kept, prepared or served. Something may be done to destroy flies in their breeding places, which is largely in the excreta from

horses, though they breed to some extent in human excrement. Cities should adopt ordinances requiring the proprietors of livery stables and individual owners of horses to screen the piles of horse manure, or to keep them covered in such a way that flies cannot breed in them. Chloride of lime which will destroy the larvæ of the house fly, should be kept in stables by the barrel full, and every few days should be sprinkled over the horse manure. These methods of lessening the number of flies are practical and inexpensive, and should be carried out on farms as well as in cities.

Typhoid infection from uncooked vegetables would be very much lessened if the practice of using human excrement or "night soil," as a fertilizing agent were not permitted, particularly upon growing vegetables which are eaten without cooking. Before eating any raw vegetables they should be thoroughly washed in water or known purity, and in boiling water where it will not destroy their flavor.

Oysters which are suspected of being infected should never be eaten raw. Oyster beds should not be allowed near the openings of city sewers, and oysters in being "plumped" should be placed in water of known purity.

Ice, in its manufacture, should be made only of pure water, and that which is obtained from ponds, lakes and streams, should not be cut near the outlets of sewers, or at other places where the water is likely polluted. However, ice is such an infrequent source of infection of typhoid fever, that we may almost wholly disregard it as a factor in the production of the disease.

Typhoid bacilli carriers should be kept under observation and not be permitted to engage in any occupation where they handle milk, or food, for others. They should disinfect their stools before it is thrown into sewers and should never be permitted to use open privies. In one typhoid bacilli carrier the germs disappeared from the stools after inoculation with Wright's anti-typhoid vaccine.

Typhoid immunization by Wright's vaccine has not yet reached the stage where it can be said to be of practical use, except in armies where the men are under the control of their superiors. The reaction from the inoculation is sometimes quite severe, and the inoculations have to be repeated several times for the immunity to be of sufficient duration to make its employment worth while.

In conclusion, I would say that the prevention of typhoid fever should begin by limiting the infection to the patient under treatment; and when physicians do their full duty in instructing the laity regarding the infectiousness of typhoid fever, as well as to see that proper methods are carried out to prevent its spread, we may almost hope that typhoid fever will cease to be one of the endemic diseases.

TREATMENT OF TYPHOID FEVER

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It is the duty of the medical profession to educate the people to a true understanding of the nature, course and proper management of typhoid fever. This will obviate the necessity of much useless and sometimes harmful medication, much of which is done by men who know the futility of trying to cure the disease. The intelligent profession are fully aware of this, but the people are not; it is therefore incumbent upon the doctor in attendance to make this clear in the beginning of the case. Attention should be given to the patient and not to the disease, for, as the disease is understood at the present day, it certainly is not curable, nor is it possible to abort it. The reputed cures and abortive treatments have all been tried out by intelligent men under favorable surroundings, and by men anxious to ascertain the truth of the claims of these cures, and they have, without exception, been found wanting. There is no specific treatment for typhoid fever that has stood the test of trial at the hands of fair, impartial and capable observers.

There is great difference of opinion as to the proper course in the management and diet suitable in these cases. In general terms, that line of management embracing the least medication, the simplest diet, the free use of water internally and externally, and the exhibition of common sense, will be the one that shows the best results and the largest percentage of recoveries.

The management is best briefly summarized in a consideration of the nursing, hydrotherapy, medicinal agents, diet, antiseptic and eliminative treatment, and treatment of special symptoms. When the diagnosis is made, or even strongly suspected, vigorous exactions should begin at once; if possible the patient should be sent to a hospital—the chances of recovery are better in a hospital than in the best appointed private home: the more serious the case the more necessary that the patient should be placed where the surroundings are most favorable to good results. The sick room should be bright and cheerful, easily ventilated and quiet; the bed should be single, the mattress firm but elastic (the old-fashioned feather bed often seen in private homes is an abomination for the sick). In all cases where possible a trained nurse should be in charge—should the case be serious, two trained nurses are essential. When such nurses are not available, written instructions down to minute detail should be left with the attendants. Complete records of every case should be kept. Small attentions in the aggregate make up the greater part of the nursing, at the same time doing much to improve and sustain the morale of the patient. Absolute rest in bed should be imposed from the beginning. Cases mild at the start frequently become severe before the end, and no one can tell how serious a case will become. Doubtless many cases are made more severe by attempting to "fight out" a walking type in the beginning. The bed pan should be insisted upon in every case, it is easier to overcome the difficulty of using it early in the case than later. Visitors to the sick should be prohibited, and efforts at entertainment before convalescence is well established are not only useless but actually harmful. The toilet of the mouth should receive

the most careful and constant attention; this certainly promotes the comfort and well-being and does much toward prevention of additional bacterial infection of the gastro-intestinal tract. A mouth wash composed of carbolic acid, glycerine, chlorate of potash and water will be pleasant and effectual. The teeth, tongue, gums, every part of the buccal cavity, should be cleansed twice daily—or oftener in severe cases. The mouth should be rinsed with clear water or antiseptic solution after each feeding. A cleansing sponge bath to the entire body should be given daily—this independent of bathing for fever. In unconscious patients the genitals should be bathed as often as soiled. An alcohol rub is comforting, cooling and antiseptic, and should be given after each bath.

The diet is one of the difficult problems of the management. In the first place, it should be liquid throughout the attack and until convalescence is well established. It should be nourishing and of easy absorption. Food may be given every three or four hours, a small quantity at each feeding. Better far a small quantity appropriated than a large amount undigested. Be careful not to overfeed, the principal lesions are in the alimentary canal. Overfeeding is bad in all forms of diseases, but especially harmful in typhoid; more patients are killed by injudicious feeding than starve to death in this disease. Taking it by and large, milk is the best diet in typhoid, yet there are many patients with whom it does not agree. Instead, however, of abandoning its use at the first signs of curds in the stools, try the various modifications. Dilute with plain, aerated or lime water, try freezing it, with or without flavoring or sweetening; try it hot or boiled; predigest it, but, above all, be sure that the milk is pure and fresh. Buttermilk is a splendid substitute and will often be tolerated—even enjoyed—throughout the attack. I have treated successfully ordinary attacks throughout, giving no medicine at all and only buttermilk as food. Buttermilk and vichy is a splendid combination. Koumiss is agreeable to many palates and answers every purpose of a suitable food. Albumen water has a decided food value and answers the purpose of a thirst reliever; it may be flavored with lemon, orange or pineapple juice and sweetened if desired; patients can be sustained for days on albumen water alone. Barley water, rice water, toast water, beef tea or broth, lamb, chicken or squirrel broth or bouillon may be used with advantage in different cases. It is perhaps desirable to vary the diet within the above-mentioned limits rather than to have the patient grow disgusted with any one food. Tea or coffee are not objectionable and are often gratefully received. Wine gelatine has some food value and may be of use in the presence of hemorrhage. It is exceedingly important to watch closely at all times the digestibility of whatever food is being used. At the first signs of disturbance manifested by nausea, diarrhoea, flatulence or distention, change the food, cut down the quantity, or leave off entirely until the disturbance is quieted, using albumen water in the interim. The resumption of solid food in convalescence should be governed by the condition of the digestive tract; at least one week of entire absence of fever should intervene before solid food is allowed, and not then if the tongue be red and glazed.

HYDROTHERAPY.

The use of water internally is of the utmost importance; this is true of all cases but particularly in the semi- or totally unconscious. If only one agent could be had in the management of typhoid fever, water should be the one selected. The administration of water should not be left to the request of the patient, but should be prescribed as to amount and frequency, and the nurse should be admonished from the beginning that it must not be neglected. There is hardly a limit to the quantity that may with advantage be taken; it supplies the waste that is continually going on; it flushes and washes out every emunctory,

it reduces fever; by it poisons of every kind are elimited; it lessens the severity of the attack and promotes the comfort of the patient. It is hard to conceive of the cruelty of olden times that denied water in abundance to these burning, parched sufferers. A good plan is to keep a free supply of pure cold water immediately at the bedsire so that the patient may help himself at will and without restriction. It can be conveniently conveyed to the patient by means of a small rubber tube furnished with a glas or hard rubber mouthpiece. The unconscious should be aroused at short intervals and encouraged to take all that he can. I have never heard any objection raised to the free internal use of water, but there can be no doubt but that it is often—very often—sadly neglected, or its importance underestimated.

The external use of water enters into every kind of management. In many it constitutes the greater and more important part of the treatment. Sponging, wet packs, and tub baths comprise the methods of application. In this country and in private practice, sponging the surface with water at different degrees of temperature is generally resorted to. By sponging with cold water at a temperature of 70 degrees F., fever can certainly be reduced and that without danger of depleting heart strength. It is more agreeable to the patient, less trouble in its applicaion; it is safer than the tub bath in the very feeble and in the extermes of age; it is not contra-indicated in those suffering from hemirrhage or any other complication where any form of hydrotherapy is applicable or needful. A good rule is to sponge at a temperature of 102.5 degrees F. or over, and repeated as often as every three hours if the temperature persistently remains above that degree. Sponging with tepid, or even hot water, is of some advantage, though less so than with cold water. In very high and continuous temperatures, sponging with ice water is decidedly efficacious and generally well borne. Cold wet packs are useful if there be conditions or complications that render tub baths unsafe. High temperatures can be lowered to a marked degree by the cold pack. It is claimed by those who have had opportunity to use the tub bath that sponging and packing are only symptomatic, and while they in a measure control or modify the symptoms, and give comfort to the patient—they do not cut short the course of the disease in a marked manner, nor can they be considered in any case curative. Whereas it is claimed for the tub bath that it is a specific treatment; when carried out from the beginning systematically and according to the method indicated by Brandt the originator, the mortality is less than under any other form of treatment known. The tub bath produces an effect on the nervous system not secured in any other way; all of the symptoms originating from the toxemia such as constitute the so-called "typhoid state" are either prevented, lessened or controlled, so that, with the application of this form of hydrotherapy the classic description of a desperate case does not usually obtain. A good influence over the skin, the temperature, the circulation and the excretions can be justly claimed for the tub bath. Unfortunately, it is hardly applicable outside of a well appointed hospital, and the people generally are not educated up to a due appreciation of this vigorous and rigorous management.

Since there are no specific medicinal agents, little need be said of drug therapy. The initial, time-honored dose of calomel or other purgative has stood the test of time and is generally used; no reasonable objection can be sustained to its use; it does not increase the tendency to continued diarrhoea, but, on the contrary, probably much oftener prevents it. Fever mixtures are without value. Quinine does not, except in enormous doses, affect the fever, nor does it influence the course or cause of the disease; it often is decidedly objectionable to the stomach and nervous system; in large doses its effect on the fever is only tem-

porary—there are no indications for its use. Dilute hydrochloric acid is a very good placebo, not much else. The indications for alcohol, strychnine or other stimulants should be plain before their exhibition. In short, the use of drugs is purely symptomatic. Limited space prevents a discussion of these symptoms and the therapeutic indications appropriate to them.

The antiseptic treatment has many advocates more or less vociferous; its value has not been proven. By the time the diagnosis is made the bacillus and its toxic effects are far beyond the reach of intestinal antiseptics. The only good that can be rationally claimed for this class of drugs is that the ailimentary canal is disinfected and further absorption prevented. It is practically impossible to disinfect the intestinal canal, but could this be done it would be equivalent to "locking the stable door after the horse was out." The greatest good accomplished by the best of them in all probability comes from the large amounts of water in which they are given.

The eliminative treatment has more to commend it, but the virtue of the treatment depends likewise more upon the large amount of water used than the drugs employed. It appears inconsistent to advocate the continued use of purgatives in an inflamed bowel hoping thereby to eliminate toxins already pervading every part of the system. Is it not more reasonable to give the inflamed organ as complete a rest as possible.

To briefly summarize—impose absolute rest, give only well selected food, use water freely, internally and externally, defer the use of drugs, especially heart stimulants, for special indications, begin to watch for complications early and continue the vigilance throughout the attack and until convalescence is unmistakably established.

600 The Atherton.

THE SURGICAL COMPLICATIONS OF TYPHOID FEVER

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INTESTINAL PERFORATION.

Of every three deaths occurring from typhoid fever, one results from intestinal perforation. This fact does not seem to be generally known, and, if so, is not keenly enough appreciated. We are much more concerned about the danger of hemorrhage, which kills only 8 per cent of those who die, and accustomed to accredit about all the other deaths to toxemia. As a matter of fact, out of 2,000 typhoid autopsies conducted by Hölscher[1] in Munich, only 24 per cent died of the fever, *per se*, the remaining 76 per cent died from the various sequellae. Therefore, of the causes of death amenable to treatment, perforation should have our most scrutinizing concern.

Upon the United States Census estimate of 500,000 cases occurring annually in this country, and with a general death rate of 10 per cent to 15 per cent, 50,000 to 75,000 people die yearly from this dread malady. Osler[2] says one-third of the deaths are due to perforation. Taylor estimates that 25,000 people die from this complication alone each year in this country. One-third of this number could be saved by operation. A report of all the cases operated upon in twenty-five years shows 30 per cent of recoveries. This means that 7,500 people perish each year whose lives might be preserved by a correct early diagnosis and a prompt and speedy closure.

The first operation was done on the 7th of April, 1884, by Mikulicz, and instead of saving these 7,500 each year for twenty-five years, over 150,000 souls, we have only saved, all told, 221 reported cases. Estimating that nearly as many more have recovered that have not been reported, the result is pitifully small.

There are a great many reasons for this state of affairs. Perhaps the greatest is the difficulty of diagnosis in a patient who is extremely ill with probably a distended tympanic abdomen, who is more or less comatose, oblivious to the pain which signals perforation, and in a general condition which is most forbidding to the surgeon. Perhaps the physician does not realize that three out of his every one hundred cases are going to die from perforation, and that each individual case may be one of that fatal three. Extenuation for this great death loss might be multiplied indefinitely. Aside from the trying difficulties of diagnosis, the actual surgical treatment has been a very desperate undertaking.

The first ten cases died. Of the 158 cases published by Keen in 1897, 37 recovered, a mortality of 76.5[3] per cent. In 1903, after an exhaustive search through the literature, I collected up to May 1, 1903,[4] 137 additional cases, published and unpublished, with 43 recoveries, a mortality of 68.69 per cent. This included three successful recoveries in my own practice. The first was in 1898, and reported in the Transactions of the Southern Surgical and Gynecological Association of 1899. It was a localized iliac abscess in a young woman ill for three weeks with typhoid fever. It was incised and drained and healed completely, but at the end of three and a half weeks she died of typhoid fever that showed a positive Widal. This case is analogous to Case No. 122 in Keen's list, operated upon by Munro, and recorded as a surgical recovery. My second case, in 1901, was in a boy of nine, with mild typhoid who was operated on at Sewanee on the nineteenth day for localized

peritonitis. Three perforations were found and repaired, and, after a long, tedious convalescence of ten weeks, with a suppurating parotid, he recovered, with a fecal fistula, which was successfully closed eighteen months after. My third case was an example of free perforation, operated upon October 8, 1902, and published in the *Medical Record* for July 16, 1904. It is, so far as I know, the first recorded instance of a successful operation for free typhoid perforation in the South. The diagnosis was made by Dr. John Sugg, of Beachville, Tennessee.

These three successful cases were reported to the American Association of Obstetricians and Gynecologists, September 13, 1903, which, together with all the reported cases up to that time, made 295 cases with 80 recoveries, a mortality of 72.89 per cent. In January, 1904, Hart and Ashurst,[5] in a masterly monograph, added 67 additional cases not included in my report, largely from the Philadelphia hospital records and reports, making a total of 362 cases up to January 1, 1904, with a mortality of 74.3 per cent. Patterson[6] has been able to collect since that time and up to May 1, 1909, 369 cases, which included five of my recent cases. In this group there were 242 deaths, a mortality of 65.58 per cent, which, added to Hart and Ashurst's series, gives a combined mortality for the 731 cases to date of 69.80 per cent, a recovery rate, therefore, of 30.20 per cent.

Of my eight cases three died and five recovered, a mortality of 37.5 per cent.

The following is a brief report of my last five unpublished cases:

Case No. 1.—E. V., male, aged 24. Had a moderately severe attack of typhoid fever in July, 1906, which lasted for twenty-eight days. Temperature did not go over 104. There was constipation, but no tympany. Liquid diet during the entire illness. Patient was under the care of Dr. J. C. Paschall, of Franklin, Tennessee, and was dismissed on the thirty-fourth day, having been free from fever for six days, during which time he was allowed to sit up in bed and take semi-solid diet. On the thirty-fifth day he was taken with a sudden severe abdominal colic, and when seen some two hours later had a sub-normal temperature, cold and clammy skin with rapid pulse. Diagnosis of perforation was made, but not concurred in by consultation until forty-eight hours afterward. When I saw him he had a pulse of 130, temperature 103, with pinched, anxious expression, distended, tender and motionless abdomen, but no vomiting. It was obvious that he had an advanced peritonitis, but his wife, who was *enciente*, and the patient wished an operation if it afforded any hope whatsoever. Accordingly the abdomen was opened and a large quantity of liquid fecal matter evacuated, and a rent as large as a twenty-five cent piece was found in the ileum. It would have been impossible to have closed this without constriction of the lumen, unless a resection had been done, which his condition would not permit. A rapid enterostomy was therefore done and the peritoneum drained. The operation only comprised about seventeen minutes. The patient received a very small quantity of ether, and was conscious a very few minutes after it was discontinued. He was propped up in bed and seemed rational, and was in as good a condition after the operation was concluded as before, but only survived twenty-four hours.

Case No. 2.—Z. F., made, aged 22, was under the care of Drs. Tucker and McCampbell, of Nashville, Tennessee, for five weeks with typhoid fever, maximum temperature being 104. On February 7, 1908, Dr. McCampbell saw him at 6:30; he was comfortable; his temperature was 103 and pulse 90. An hour later he was seized with intense abdominal pain and a frequent desire to urinate. Dr. Tucker saw him at once, and found the temperature had dropped to 99 and pulse had risen to 118; he had been given an enema for relief. I was asked to see him in a few minutes, and in addition to the above, found the

abdomen flat, but quite tender and rigid. A diagnosis of typhoid perforation was made, and he was at once taken to the hospital. The abdomen was open within three hours after the onset of the pain, and perforation was found about the size of a small lead pencil, about 22 inches from the ileo-cecal valve. Gas and liquid feces escaped through it as it was drawn in the wound. It was closed with a purse-string suture of linen. The ileum was gone over thoroughly and no other aperture found. A glass drainage tube was placed into the bottom of the pelvis, through a stab wound above the symphysis. He was returned to bed in good condition. The glass drainage tube was exhausted every two hours. Twenty-two hours after the operation the patient was seized with severe abdominal pain, and shortly thereafter the dressings and bed were observed to be soiled and a considerable amount of yellow fluid, with a fecal odor, flowed onto the linen. This occurred in the early morning hours, but the abdomen was reopened within two hours after the occurrence. The site of the perforation which had been sutured the night before was found to be perfectly closed, and about twelve inches from this and toward the ileo-cecal junction another perforation about the size of a crow-quill was found and immediately sutured. There was so much of the yellow fecal fluid in the abdomen that it was irrigated and drainage established.

He stood the operation fairly well, was put in Fowler's position, and given a continuous Murphy instillation enema of salt solution, and his condition was fairly satisfactory for two days. There was no distention or vomiting, or other evidences of peritonitis, but his fever continued high and he died in seventy-six hours from typhoid toxemia. A resection of the ileum was made, and specimen preserved.

Case No. 3.—Mr. R., aged 23, had ordinary attack of typhoid fever in July, 1908, under the care of Dr. Sugg, of Beachville, Tennessee. At the end of four weeks he was free of fever for four or five days, when he had a relapse and the temperature recurred and remained very high. On the night of July 19, at 10 o'clock, he had a normal bowel movement, but at four in the morning was taken with a sudden, continuous abdominal cramp, which persisted for some hours, at which time he obtained relief from hot applications. His temperature was not accelerated, and his pulse, which had been rapid all the time, remained at 120. There was no marked tenderness or rigidity until in the afternoon, when the abdomen was distended and rigid, temperature 104, and pulse increased in rapidity. When I saw him sixteen hours after the onset of the symptoms his condition was very grave, but his friends inclined to the operation, because his neighbor had been operated upon by me successfully.

After the abdomen was opened a considerable quantity of purulent fluid escaped and the ileum was explored for a distance of three feet without detecting perforation; as it was gone back over and the cecum was drawn in to the wound, an aperture was found about the size of a lead pencil on the inner wall of the caecum, about one and one-half inches above the junction. This was closed by linen suture, and drainage established by gauze in a split rubber tube; no irrigation. The usual post-operative treatment was given, but the patient only lived thirty-two hours.

Case No. 4.—Mrs. S., aged 44, had an attack of typhoid fever, and was under the care of Dr. Bradford, of Belleview, Tennessee. At the end of three weeks she had a sudden abdominal pain and was in great prostration for several hours with sub-normal temperature, rapid pulse, and blueness of the skin. Pain required morphia for its relief. She gradually recovered from this condition, and at the end of ten days a distinct tender tumor was found in the right idiac region. It was diagnosed as typhoid perforation abscess and evacuated on the twelfth day and drainage established.

Fecal matter escaped through the wound for some ten days, at which time it ceased and the entire wound had closed in three weeks. The patient made an faebrile recovery.

Case No. 5.—B. C., aged 11, had a mild attack of typhoid fever, and was under the care of Dr. J. Q. Owsley, of Nashville, Tennessee. The fever lasted about four weeks. She had been normal for nearly a week, and had been on semi-solid diet, with the exception of a small portion of baked apple which she ate for supper. About four in the morning she was seized with a severe cramping pain, for which her mother applied the usual household remedies, and after which the doctor was obliged to administer an opiate on his arrival some two hours later. The abdomen was distended, rather tender, somewhat rigid and tympanitic. Temperature had risen to 101, whereas it had been normal for five or six days. The pulse was 120, and she had vomited twice. She had rather an anxious expression and was still suffering in spite of the opiate. Perforation was suspected and operation was performed about thirteen hours after the onset of pain. Upon incising the peritoneum a considerable quantity of turbid serum welled up through the incision. The intestines were bathed in this fluid. The entire ileo-cecal region was searched thoroughly, but no perforation was found. The abdomen was closed with drainage; no irrigation. She was placed in Fowler's position, and upon the third day was normal, all unpleasant symptoms having subsided. The drainage was removed on the fifth day and convalescence was uneventful. Although no culture was made, it was an unmistakable case of typhoid peritonitis.

Cause—In the presence of tympanic distention it can be easily seen how a sudden turn in bed or violent vomiting, attempt at getting up, the eating of solid or indigestible food, purgation, straining on the bed pan, too large enema, or one rudely administered could produce a perforation in an ulcer which had already necrosed through the mucosa.

Over one-half of the cases occur between the second and third week, because the sloughs are prone to separate about that time. The perforation may vary in size from a pin-hole opening to a hole as large as a half dollar. It can also be understood how mechanical violence could practically cause a "blow out." The perforation is usually single (236 out of 271 instances). It occurs in the ileum in 76.6 per cent of the cases, usually within eighteen inches of the cecum (Osler) and always within three feet (Loison). It may also be found in the ascending, transverse and descending colon, sigmoid and rectum in the order named. It may also occuur in the appendix, Meckel's diverticulum and the jejunum.

The perforation may occur in the ambulatory type, and has been known to be the first recognizable symptom. The accident may happen at any time during the course of the disease, Mr. Paul[7] having reported a case that occurred three months after the onset of the fever, and others have supervened two months after recovery. The twenty-seventh day was found to be the average time of occurrence (Woolsey[8]). Over two-thirds of the patients are under thirty. The youngest reported case was five yearsold, and the oldest sixty-five. It seems to have happened to whites much oftener than to blacks, and it occurs in men four or five times as often as in women. It is much rarer in children, but the per cent of recoveries from the ages of six to fifteen is twice that of adults. Elsberg[9] recites twenty-five cases of perforation in children where operation was done with only 36 per cent mortality.

The second perforation sometimes occurs, and is nearly always fatal. There have been twelve such cases reported in the literature, all dying. This has been my own sad experience in one instance. It occurs most frequently in cases of average severity that have run a rather typical course. It seems that the hemorrhagic cases are a little more prone to

it because the tendency to ulceration is greater.

Murchison estimates the mortality at from 90 to 95 per cent, but Osler could not recall a single case that had recovered. I believe his statement is true with relation to free perforations that occur into the peritoneal cavity. Of course, if it is previously walled off by adhesive involvment and should result in an abscess, as in two of my cases, the condition then becomes identical with the appendiceal abscess of similar geography, but, of course, with a very much more serious general condition.

One of the pioneer oculists of this city survived such a complication during the course of a typical case of typhoid. The abscess ruptured spontaneously, resulting in cure. Seeds of strawberries which he had eaten subsequently passed through the aperture before it closed.

The symptoms are, unfortunately, not always all present until the unmistakable evidences of advanced peritonitis are present. The classical clinical picture in the text-books are not the symptoms of perforation, or even of beginning peritonitis, but of advanced infection, and really is a fine picture of impending dissolution. I would urge, therefore, that we erase from our minds the Hippocratic facies, profuse sweat, cold extremities, pulselessness, with sighing respiration, motionless abdomen, restlessness and delirium. These are still conclusive enough that perforation has occurred, but it nearly always means that it has been a number of hours or days before, and this is the unmistakable approach of dissolution. Unfortunately, perforation may be so small and extraviasation so silght that there is no decided change in the symptomatology that would betoken it. Pain is the most important single symptom, and is present in quite three-fourths of the cases. It is usually sudden, of a severe stabbing character located in the lower right side, and may cause the patient to writhe in agony which lasts for several hours, and is only to be assuaged by morphia. It may be masked by the hebetude of the typhoid state. If the patient is lethargic, little or no complaint may be made, or only slight discomfort may appear even in those of clear mind. Pain may be due to hemorrhage, or to a number of other pathological conditions of known causes. Inasmuch as it is our most trustworthy guide, it should be regarded as of the utmost significance occuring in the first few weeks of illness. Nurses should be cautioned to report at once the development of the slightest pain, and it should be for the physician to say whether or not it is due to perforation. If vomiting should occur in association with the pain, particularly if for the first time in the illness, it is very suggestive. It was the initial symptom in two out of nineteen cases reported by Manges,[10] and was present in seventeen others. We have been taught to believe that perforation is attended by sudden drop in temperaiture. Most authors do not now concur in that belief. If present at all it is quite transient, unless there should be a tremendous inundation of the peritoneum. As a matter of fact, most cases are followed within a few hours by a rise of temperature, even though there is a primary fall. The pulse usually goes twenty to thirty beats higher, and the respiration is likewise accelerated. A rise in all three is the rule.

The most important physical sign is rigidity. I refer to the real involuntary rigidity that is ascertained by the most delicate palpation. It is wrong to press or punch the patient in the abdomen, as rigidity can always be elicited in that rude way, and defeats the object of the examination. Tenderness is one of our best guides, especially if located in the right iliac region and in connection with pain, vomiting and rigidity. Daily observation of the abdomen enables one to appreciate such changes, and delicateness of manipulation is essential to correct evidence. The patient's countenance is usually anxious, "the index to the agony of the soul." The French call it *abattement*, a

weakening of the countenance. We are accustomed to designate it as the anxious facies, but not of the marked, pinched type which later appears in all cases of general peritonitis.

Sudden leucocytosis occurring in this connection is of value, although its absence should not negate perforation.

Two new signs have been described by Brown.[11] First, a "dipping crackle" obtained by placing a stethoscope over the right iliac fossa, dipping sudenly and a fine crackle like fine crepitant rales is elicited. He found these in three out of seven cases. Second, a shifting point of tenderness is obtained by shifting the patient.

In supposed cases of perforation, I think we should not move the patient any more than possible, and certainly not to get movable dullness by allowing the extravasated fluids to flow from one side of the abdomen and back.

Obliteration of the zone of hepatic duliness is, too, a sign that is not trustworthy, should never be waited for, is often present without perforation, frequently absent with it, if present at all, it is a late sign, and not to be considered in making up the diagnosis.

Increase of blood pressure has been described by Crile[12] as occuring very frequently in this condition. If present and marked, appearing immediately after the catastrophe, it should be given some credence in connection with the other signs. A stationary pressure should not be used as an argument against perforation.

Pain, tenderness and rigidity are the trinity of symptoms which are most constant and dependable. If associated with vomiting and a rise of pulse and temperature, exploration should be advised at once. Severe abdominal pain in connection with any one other well recognized sign is an indication for operation. Get things ready while the family are considering it. Multiplicity of consultation is certain of delay, and speedy closure and drainage are the essentials.

The differential diagnosis is important. Hemorrhage is probably the most frequent condition outside of other abdominal lesions. It is attended with less pain, as a rule, more collapse, lowered blood pressure, a gradual instead of rapid increase in pulse, no rigidity, and if blood is not passed in a short time an enema will determine its existence.

In appendicitis, collapse is not so marked, vomiting is more frequent in the beginning, and the pain is usually referred to epigastrium or around the umbilicus.

Pleurisy and pneumonia sometimes give all the abdominal signs of perforation, and a thoracic examination should always be made. There are many other lesions which do not involve the peritoneum, such as gastritis, enterocolitis and distended bladder. Within the peritoneum, strangulated Meckel's diverticulum, ruptured infected mesenteric glands, thrombosis of the iliac and femoral veins, splenic infarcts, liver abscess, intussusception (nine recorded cases, 4 out of 5 operated on recovered) and volvulus (four cases), and perforated gastric and duodenal ulcer may simulate perforation. Cholecystitis, with or without peritonitis, may present pain, tenderness and rigidity with vomiting and rapid pulse. It may be mistaken for perforation. Keen collected thirty-four such cases. Peritonitis from any cause will do the same thing. There are a number of cases of peritonitis of typhoid origin without perforation. Whether from the escape of bacetria through an impaired wall without actual perforation, or whether due to some other of the usual causes of peritonitis, it is often impossible to tell and really immaterial because exploration, repair and drainage is the indication in any event.

The best results were obtained in rather healthy adolescents in the first week of illness before they were fever-wasted; operation in the first few hours after a perforation, situated near the ileo-cecal junction, in which there was little or no extravasation, seemed to give the ideal conditions for success, and still

the mortality is nearly 50 per cent. However, 55 cases, surviving 36 hours before operation, gave a mortality of only 67.2, which means that the infection was milder and the escaping contents less copious. Only the moribund cases should be declined.

Ether by the open method, administered by a careful and experienced anesthetist, preceded by morphia and atropia, is, after all, about the best anesthetic. It is a stimulant, pleasantly administered in this manner, and a minimum quantity can be used. The operation should be completed in as short a space of time as possible. It is almost a race with death, and yet only five cases have been reported where death occurred upon the table.

The incision should be made at the outer margin of the right rectus muscle. It gives ready access. The cecum should be at once located and drawn into the wound and a thorough exploration made of the lower ileum. Failure to find the perforation should cause the same section of the bowel to be systematically reexamined from above downwards. Small perforations are best closed by a purse-string suture of linen; larger ones by Lembert sutures. Resection should practically never be done, as the mortality is nearly 100 per cent. If the opening is too big to close by suture, an artificial anus should be made, preferably by gauze packs and a few sutures of catgut. Escher thus saved three out of four patients, and claims that drainage of the infected bowel is of value. It is the quickest way to dispose of a badly damaged gut.

Irrigation has been a greatly mooted question. I think the conclusions of most men at present are that when a considerable quantity of fecal matter has escaped, lavage should be practiced with normal salt solution. If the escaping fluid is localized or small in quantity it should be gently mopped out and thoroughly drained. It is unwise to attempt to remove the protecting serum which nature has thrown out. When this is removed there may be no more leucocytes for nature to draft into the peritoneum. In all cases, what is done should be done quickly, and he is the best surgeon for these patients who, knowing all methods, is able to instantly decide which is the best plan for the particular case. Wicks of gauze in rubber tissue are excellent drains in the first few hours when they are needed most. A stab wound over the symphysis large enough for a big glass tube should be made in all cases of generalized infection. Drains should never be allowed to touch the sutured area. As soon as nature can cover the suture line with adjacent viscera the better. Indeed, omental grafts are advised, but if the patient has a good omenum it will automatically protect the sutured area if properly arranged. The elevated posture, with the patient in a slanting rather than a sitting position, is unquestionably of value. Proctoclysis, by Murphy's method, using a pint of salt solution every hour for a number of hours, is our greatest therapeutic resource in the dilution of the toxines and tiding the patient over the acute stage of sepsis.

Certain death in those cases left to themselves and the ability to save one-third of these doomed sufferers, should spur us to our best endeavors. The triumph of saving any of these cases is so great that no schooled surgeon should be deterred.

GALL-BLADDER.

Typhoid affections of the gall-bladder are second only to intestinal perforations in frequency and importance.

Louis, in 1829, recognized the relation between typhoid and gall-bladder disease, and described a case of typhoid cholecystitis. Other clinicians were acquainted with the complication, and Hagen-Miller, in 1876, could collect sixteen cases from the literature, and suggested the subsequent formation of gallstones. Futterer, in 1888, discovered the typhoid bacillus in the gall-bladders of patients dying of typhoid. At present it is believed that typhoid bacilli exist in the gall-bladder in nearly every case of typhoid, whether typical

or atypical. However, simple invasion of the bile passage does not often lead to pathological changes, but some pre-existing changes, such as gall-stones, is necessary. On the other hand, typhoid infection has a tendency to result in gall-stone formation, even if no symptoms of cholecystitis existed during the course of the fever.

The bacilli enter the gall-bladder through the bile from the liver, or directly from the blood, and not by ascending infection from intestines. Considering the anatomic and circulatory relations between the gall-bladder and liver and intestines, the frequency of gall-bladder disease is remarkably small. In 2,000 autopsies at Munich but twelve were complicated with liver abscess, five with ulcerations of gall-bladder, and three with acute yellow atrophy.

Several cases of primary infection of the gall-bladder have been reported (Wilson,[13] Ehrlich,[14] Pratt,[15] Kelly,[16] and others. This complication is more frequent in females between 20 and 40 during second and third week of the fever.

The pathology varies from a mild inflammation of the mucosa to empyema, ulceration, necrosis and perforation.[17] Thomas collects 134 cases of gall-bladder disease. Of this number 39 had perforation. Eleven were operated on with a mortality of 54.6 per cent. Of this series of cases, more occurred between the ages of ten and thirty, and between the eleventh and thirtieth day of the disease. Gall-stones were found in three cases. Typhoid bacilli were isolated in 50 per cent of cases. Ashurst[18] says that from January, 1905, to October, 1907, 2,864 cases of typhoid fever were treated in Episcopal Hospital, Philadelphia, and 18 cases were complicated by cholecystitis. Symptoms are divided into two separate classes. In the first class, symptoms come up during the height of the fever, the patient's condition may be such that the symptoms are not easily elicited, and the condition may be overlooked. In fact, in many cases the complication is unrecognized. By careful examination, however, there will be found a gradual onset of pain and tenderness in right hypochondrium, and a palpable gall-bladder will reveal a cholecystitis or empyema and commencing ulceration.

In the second class, after the above symptoms have been present for a few hours or weeks, there is a sudden abdominal pain, fall of temperature, sometimes meeting with a secondary rise of temperature, spreading pain, tenderness and distention. These symptoms should lead to a diagnosis of perforation and spreading peritonitis.

In a series of 21 cases reported by Ashurst, in only 11 were correct diagnoses made. In 9, symptoms led to a diagnosis of intestinal perforation, and in one case, only a diagnosis of peritonitis could be made. If cholecystitis arises during convalescence the diagnosis is simpler; sudden sweating, acute pain, associated with high temperature and vomiting should suggest gall-bladder disease.

If perforation is suspected, operate as soon as possible, and do a cholecystectomy. In the absence of symptoms indicative of perforation, operation should be deferred until acute symptoms have subsided, and then, if necessary, do a cholycystostomy. Quenu,[19] in *Revue de Chirurgie*, 1908, Vol. 37, records 30 cases of operation for cholecystitis during the typhoid course. In 17 a cholecystostomy was performed, in 5 a cholecystectomy, and in the remaining 8 there were imperfect operative procedures. A combined mortality of 40 per cent resulted. In 14 operations during convalescence four deaths resulted, but in two cases the condition of the gall-bladder was overlooked, and excluding these two cases there was a mortality of 16.6 per cent. Ashurst collected 21 cases where operation was performed during the course with mortality of 61.9 per cent, but in four, gall-bladder lesions were unrecognized. Excluding these we have a mortality of 53 per cent.

The "typhoid carriers" usually have a cholecystitis as the *fons et origio.*

ABSCESS OF THE LIVER.

Verema and Cumberg,[30] of Berlin, in 1907, record 26 cases of typhoid abscess of the liver. Of six cases studied bacteriologically, al contained typhoid bacilli. Of six cases treated by surgical procedures in the last ten years, four recovered. It may be consequent upon intestinal transmission, osseous or parotid complications. The advent is practically symptomless on account of the dulled condition of the patient. When there are tenderness, enlargement, bulging of the hepatic area the diagnosis is obvious. Leucocytosis is valuable and aspiration confirmatory.

The writer had one case of abscess of the liver in a boy of twenty-one, which developed twelve years after the attack of typhoid, and in which no other cause for the abscess could be discerned. He was taken suddenly with sharp pain in the upper right abdomen, with chill and vomiting, followed by temperature and a tender swelling under the right costal margin. It was diagnosed cholecystitis, but upon operation the gall-bladder was found normal and the right lobe of the liver was enlarged and caused a palpable tumor. It was aspirated at a soft spot and several ounces of golden, purulent material evacuated. The abscess was incised at a second sitting, under gas, with a cautery. It appeared to be solitary. The pus was practically sterile. He subsequently developed a pleurisy with an abscess in the upper part of the right lobe, both of which infections were drained by resection of the eighth rib. After a long illness death resulted.

STOMACH.

Typhoid ulceration of the stomach has been observed, causing pain and hematemesis. On several occasions it has involved the esophagus causing subsequent dysphagia, contraction and stricture.

BONES.

Osseous affections occur so late that they may be called a sequel. The bone marrow is especially inviting to the typhoid bacilli. They may pass from the ulcers into the blood and then to the bones in large numbers and remain for a long time in the bone marrow. Therefore, the frequency of bone complications can be explained by the viability of the germs in the bone. One case occurred seven years after the fever. Bone sequellae, are usually later than the other surgical complications, generally during convalescence, and never before the tenth day. They often present successive and multiple foci of infection. Osteo-periostitis and oste-myelitis are the forms most frequently encountered. Males are twice as often affected as females. It occurs three times as often in patients over thirty years of age. The ribs and costal cartilages are more often affected later in life, generally the osteo-myelitic type, and several ribs are usually involved in the process.

The lower extremity is more often affected than all the other parts of the body combined, and the tibia on the antero-internal part of the shaft is the most frequent site in the body. It is so far distal that the circulation is somewhat sluggish. The bones of the feet are more spongy and escape. The superficial bones are more affected than the deep ones. Injury, muscular strain and old fractures predispose by lowering that point of resistance, and the germs harbored in the bone marrow nearby enter and set up a typhoid inflammation. The process is purely local, and the returning health and vitality of the patient may be able to overcome the infection. If it does not, any of the varieties of bone lesions may result, such as periostitis, osteomyelitis, caries and necrosis.

The absence of constitutional symptoms is a distinguishing feature. This is probably due to the auto-immunization. The local symptoms are pain, tenderness and swelling, and if resolution does not occur, fluctuation may appear at the end of ten or fourteen days. Abscess may rupture and a sinus persist for

months or years, and a peculiar thing about this sinus is that, even after several months of discharging, pure culture of the typhoid germ may be obtained. Operation is indicated unless spontaneous resolution is taking place. If fluctuation is present, operate at once. Remove the diseased bone thoroughly. Several operations may be necessary to remove all diseased bone. This is especially true in connection with the ribs, due to the extension of the process and to the danger of injuring the adjacent pleura and pericardium. The operation, therefore, is often incomplete. Most cases are chronic, sinuses persist and recurrences are frequent, requiring re-operation, but in most cases recovery will be the ultimate result. About 6 per cent die, but always from mixed infection. Pure culture cases all recover.

The writer has had three cases in the ribs and costal cartilages after typhoid fever, two males and one female. The first recovered after five operations by a colleague for the removal of portions of cartilage. The woman recovered after a second operation, which cured a sinus that had persisted for over a year. Four inches of the costal cartilage and fourth and fifth ribs were removed, and the costo-sternal junction excised. The pleura was opened accidentally but closed without trouble. The third case developed a lump, not red nor tender, on the left sixth costal cartilage and rib. Primary excision resulted in cure. There were no constituional symptoms in any of these cases.

It is essential in the after-treatment to keep the wound flaps elevated with gauze underneath for absolute disinfection and unobstructed drainage. If the skin edges are not kept elevated so that healing takes place from under the ledge they are notoriously disappointing.

Autogenous vaccines might be of value in these intractable cases.

JOINTS.

Arthitides of the serous, plastic or suppurative variety may occur late in the history of the disease. The condition may be monarticular, or polyarticular. The latter is less serious, and the effusion is more apt to be of the serous type.

The monarticular variety affects the larger joints, especially the hip. It occurs more often in young subjects. Marked swelling results. Pain may be slight or severe, and suppuration is rare. Ankylosis may result, yet in one-half of the cases collected by Keen dislocation resulted from the accumulation of fluid within the point. The pressure from the fluid is exerted upon the posterior part of the capsule. The Y-shaped ligament remains tense, and a spontaneous backward dislocation results.

Treatment by reduction and retention with plaster of paris is required. Open incision may be necessary to accomplish reduction. If ankylosis exists, an osteotomy will be necessary.

SPINE.

"Typhoid spine" may appear late in the disease. The symptoms may resemble Potts' disease. A true osteomyelitis exists, and acute symptoms involving usually the lower dorsal or lumbar region are present. The condition may be differentiated from Potts' disease by the symptoms being more confused coming on in an adult, following typhoid, and the absence of the characteristic deformity of Potts' disease.

If in doubt the tuberculin test might be employed.

Of 67 cases analyzed by Silver,[21] the average age was twenty-seven. Thirty-four began during the fever or during the convalescence, 14 within one month, and the others one, two or three months later. Ninety per cent occurred before the end of the first month. A rise of temperature occurred in over one-half. Over three-fourths occurred in the lumbar region; 47 per cent was completely cured. The average duration of treatment was about

eight months. Fixation of spine with brace of plaster of paris is indicated.

THYROID GLAND.

Suppuration of the thyroid is a rare complication of typhoid. Prior to 1907 twenty cases had been reported. In 19 cases the typhoid bacilli was isolated from the pus. In 8 cases a Widal reaction confirmed the diagooses. In most cases there was an already hypertrophied thyroid, and in one case the thyroid seemed to be primarily infected. A mortality of 40 per cent is reported by Keen. Incision and drainage is the indication. Removal of a complicating goiter is of questionable feasability at that time.

PAROTID GLAND.

Parotitis is most frequent in the third week of the disease, and is usually unilateral. The cause of the parotitis may be from pyogenic invasion, or from the pure typhoid bacillus. In the majority of cases suppuration results, and is a very fatal complication. Extensive sloughing may result. In Osler's series of 14 cases, five died. In 28 cases recored by Keen, eight died, a mortality of nearly 30 per cent. Males are more often affected than females. Average age was nineteen. Out of 34 cases, 29 suppurated. Parotitis was bilateral in 12 cases, and in seven cases suppuration was bilateral.

The writer had one case following a localized peritonitis from intestinal perforation reported herein, resolution tardily occurred after incision and drainage.

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METASTASES IN CARCINOMA OF THE BREAST

REPORT OF AN INTERESTING CASE.

Choice of Operations for the Cure of Mammary Cancer.

BY CHAS. A. ROBERTSON, M.D., Nashville, Tenn.

One of the most formidable, yet interesting, conditions in pathology is found in the occurrence of metastasis in the course of carciinomatous disease.

An intelligent understanding of the avenues by which cancer cells are transferred to the viscera and other parts of the body is the only safeguard in its prevention, when surgical principles are properly applied, sufficiently early, to the primary focus.

There is but little known concerning the etiology of carcinoma, or as to the exact *materies morbi* which are primarily the cause of cancer.

There is perhaps no doubt that the protoplasmic nucleated cell characteristic of carcinomatous disease is capable of producing the morbid growth when transplanted, just as the horticulturist would transplant a shrub under proper soil conditions.

Without, therefore, discussing the many theories which have been advanced as to the primary cause of cancer, we will state briefly that every case of carcinomatous disease has ever present the one and only essential element necessary in its transference by metastasis, namely, the Cancer Cell.

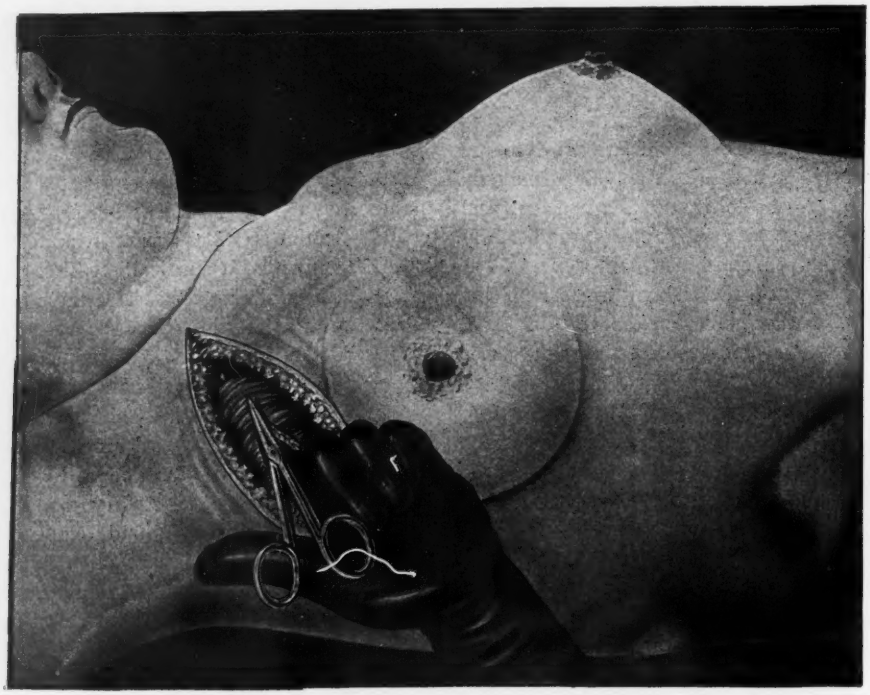
The cancer cells may become disseminated and metastasis occur by one, or all, of three avenues; first, directly through the main lymph channels; second, by direct extension through the growth of cancer cells along the minute lymphatic vessels, the "permeation" theory of W. Sampson Handley, of London; third, through the blood current.

Just how early the neighboring lymph glands become involved in cancer of the breast it is difficult to say, as no very conclusive and satisfactory statistics are available on this point. However, I believe I can justly claim to be conservative when I say that when cancer of the breast exists, even in its least malignant form, the anatomicaly associated lymph glands should be regarded as having been invaded by an army of cancer cells, and should be looked upon with surgical hostility. Thus early, there can be no doubt that these cancer bodies are transferred through the main lymph vessels, aided by the deep and smaller lymph vessels originating in the mucosa of the galactophorus ducts and glandular alveoli.

The lymph glands invaded are to some extent determined by the location of the malignant neoplasm in the mammary gland. All parts of the mammary gland empty their lymph stream into the axillary chain, but when the growth occupies the outer and upper quadrant, and is not adherent to the pectoral fascia, the cancer cell transference is almost wholly limited to those glands found in the axillary space. When the growth occupies the upper and central portions of the gland, the subclavian chain and supra-clevicular glands are quickly involved, although this may occur through the efferent lymph vessels from the axilla. This is important from the standpoint of prognosis, as no case, with palpably enlarged cancerous glands above the clavical was cured out of forty cases operated upon in the Massachusetts General Hospital. (Jour. Surg. Gynec. and Obst. Greenough, Vol. V, p. 37.)

The pleurae, lungs, mediastinal glands and

spinal column are especially liable to metastasis when the growth is situated in the deep central portion of the mammary gland with involvement of the pectoral fascia, or deeper tissues of the chest. Those malignant growths occupying the inner hemisphere specially favor metastasis to the opposite breast and lymphatic structures contained in the opposite axilla. Out of 422 cases collected by Handley this occurred in 16, or 15 per cent. the liver and explain the rather frequent metastasis in that organ. It must be borne in mind that should the malignant neoplasm occupy the lower hemisphere of the mammary gland the inguinal glands may become involved through the minute lymphatic vessels connecting the main trunks as a network along the line of "water parting" separating the middle from the lower catchment area of zone as described by Handley.



DIVISION OF PECTORALIS MAJOR NEAR ITS INSERTION.

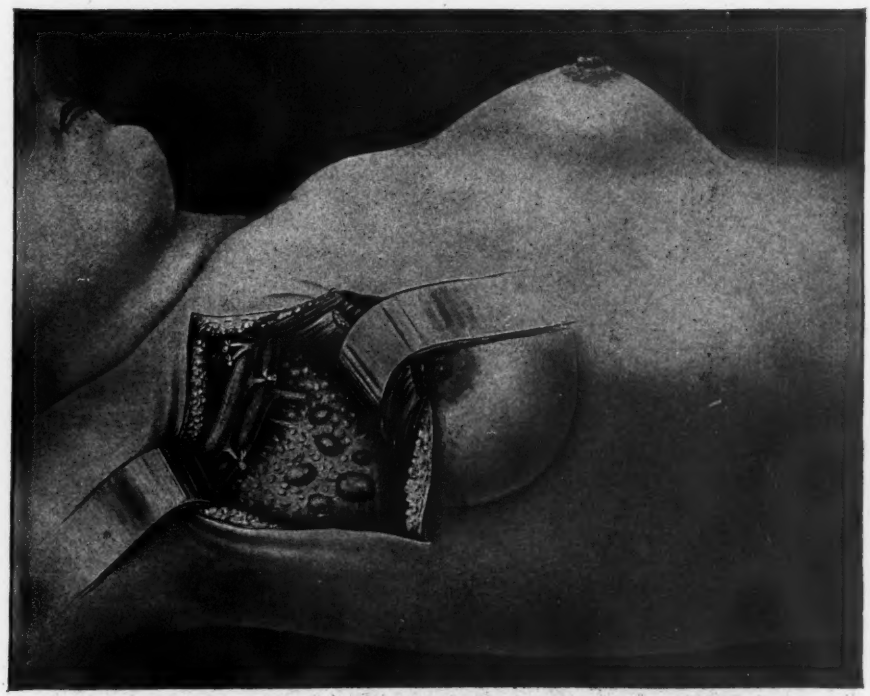
(From Dr. Rodman's Book.)

Carcinomatous involvement of the opposite breast is usually supposed to be due to the dissemination of cancer cells through the superficial lymphatics, but Handley claim that it may occur by the trunk lymphatics and permeation along the fine lymph vessels. The deep set of lymph vessels entering the thorax through the second and fourth intercostal spaces communicate with the lymphatics of

The permeation theory of W. Samson Handley is said by Rodman to be based upon accurate observations, and that cancer cells are disseminated by actual gorwth along the fine lymphatics and thus permeate their way to neighboring tissues. The facial lymphatics plexus serves as the anatomical basis of Handley's deductions. He claims that lymphatic emboli do not occur except late in the disease.

That metastasis may take place through the blood does not admit of a serious doubt, but that the blood current does not furnish the distributing medium as frequently as was at one time thought, practically all authorities are agreed. Metastasis by the blood current may take place in one of two ways: Cancer cells carried to the axillary glands may be emptied into the subclavian vein on the right side, or the thoracic duct on the left, and hence to the distant tissues. Or, the cancerous process may involve a vein or veins by direct growth into and through the vessel wall, and cancer cells or emboli gain entrance into the general circulation.

Three-fourths of all carcinomata of the liver are secondary (Douglas), and probably the breast next to that of the stomach is responsible for the greatest number of carcinomatous metastases in that organ. Metastasis in the lungs occurs next in point of frequency. In 423 cases which want to autopsy, S. D. Gross found pulmonary metastasis in 49.9 per cent. The pleura was involved in 38 per cent of 422 cases collected by Handley. This may occur secondary to deposits in the lungs; from the mediastinal glands, from the supraclevicular glands through Sibson's Aponeurosis; by direct invasion, by cancerous involvement of the bones of the chest walls.



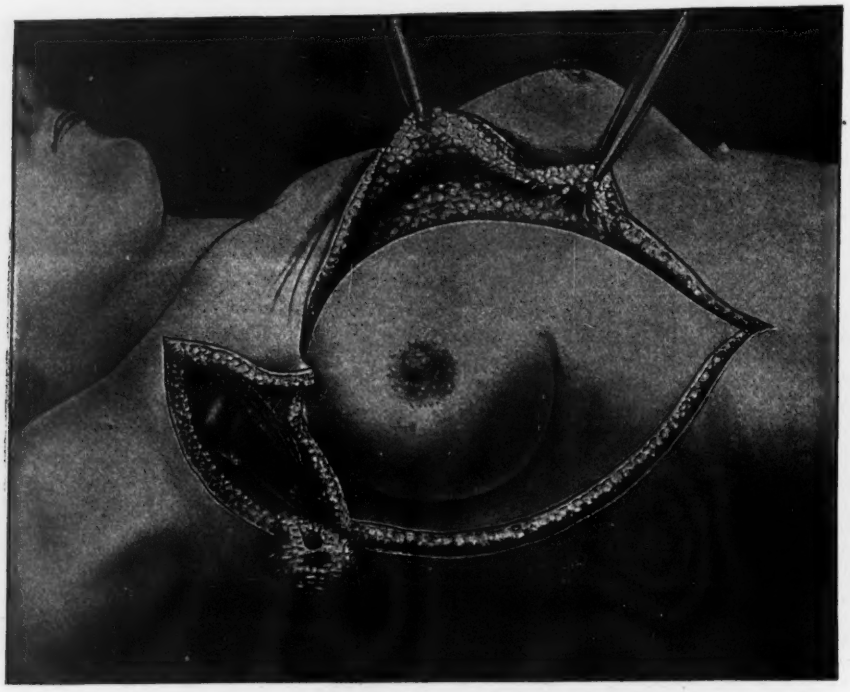
AXILLA FREELY EXPOSED AND VESSELS DIVIDED AT THEIR ORIGIN.

(From Dr. Rodman's Book.)

One of the most interesting occurrences is that of metastasis in bones together with the production of spontaneous fractures. The sternum and ribs may be involved by direct extension of the primary disease. The morbid process in the axilla may invade the hu-

humerus. With these exceptions cancerous osteoplastic changes are due to dissemination of cancer cells through the blood current. In 554 cases submitted to autopsy, 13 per cent, or 82 osteoplastic metastases are reported by Hahn (Osler, Am. Med. Apl., 1901). There seems to be especial predilection for the long bones, such as the humerus and the femur, but Rodman states that this is more apparent than real, and is made apparent because autopsies have not been complete so far as the examination of the osseous system is concerned. Thus we find by reference to the work of Torok and Wittelschofer that the cranial bones were examined in 336 autopsies and they were found diseased in 33 cases, or 9 per cent of the total number. It is insisted by Mr. Handley, in his statistics from Middlesex Hospital, comprising 329 cases, that the bones nearest the primary neoplasm are invaded. The clavicle being a notable exception.

Certain it is that spontaneous fractures most frequently occur as a result of secondary cancerous deposits in the humerus and femur, and many interesting cases may be found in literature. Metastasis occurs in the bones of the spinal column in about 3 per cent of the cases, although Osler reports spinal symptoms occurring in 10 out of 29 cases of his series, or 34 per cent, and states that they are the most common secondary lesions of mammary cancer. They produce varying symptoms from severe pain to paraplegia, and from the standpoint of maximum suffering and disability they are by far the most serious of all metastatic lesions. The early symptoms of many of these spinal cases are very likely to lead one into the error of mistaking hysteria or



SECOND SKIN INCISION. OBSERVE THE EX TENSIVE UNDERMINING ANTERIORLY.

(From Dr. Rodman's Book.)

neurasthenia for the real condition. Dr. Osler in Am. Medicine Apr., 1901, and the British Medical Journal, January, 1906, writes entertainingly of the medical aspects of carcinoma of the breast and quotes Mr. Shields as first calling attention to the readiness with which this error of diagnosis may be made.

The brain and its coverings are effected by metastatic carcinoma, doubtless through the blood current similar to that by which the cancer cells are transferred to the bone. The bronchial and mediastinal glands may become involved and produce death by gradual suffocation, amid the horrible pangs of severe pain, constantly increasing dyspnoea, paroxysmal cough, marked lividity due to venous pressure, with hydro-thorax and pulmonary oedema closing the scene of the struggle.

Metastasis was found by Gross to occur in the uterus in over 5 per cent of the cases which he studied, and the ovary was effected in 8.6 per cent of the cases collected by Mr. Handley in Guy's Hospital.

The thyroid gland, mesentery, heart, pericardium, kidneys, peritoneum, omentum and pancreas are all subject of matastasis from carcinoma of the breast, and while their involvement is rare, yet such possibilities must be borne in mind in connection with the question of diagnosis.

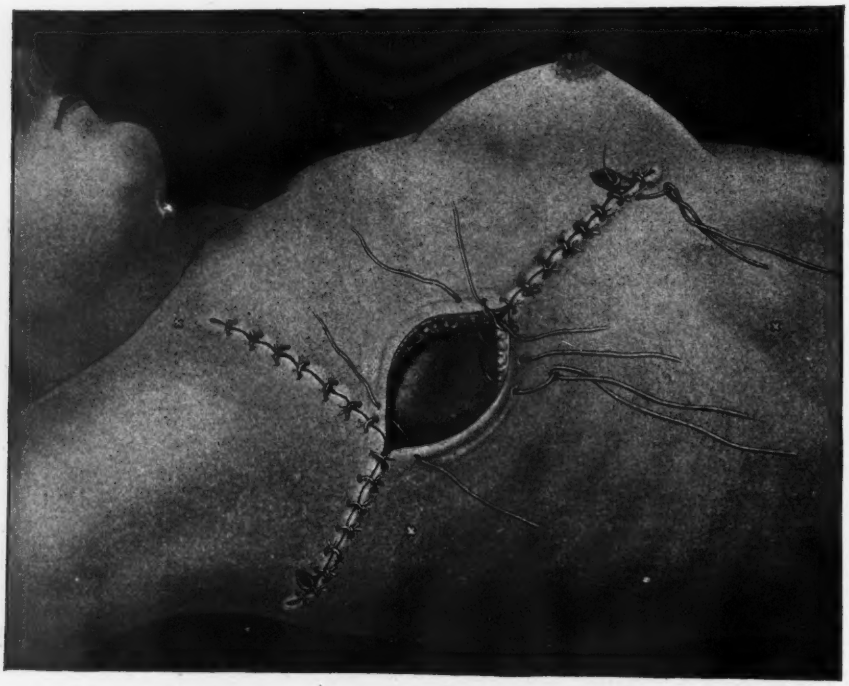
APPEARANCE OF THE WOUND AFTER REMOVAL OF THE BREAST, MUSCLES AND AXILLARY MASS.

(From Dr. Rodman's Book.)

It is gratifying to know that, however serious and distressing these secondary lesions may appear, and notwithstanding the almost universal hopelessness of these cases, spontaneous recovery is within the bounds of a hopeful possibility. Pearce Gould, Valpain.

Osler and others have reported interesting cases illustrating the spontaneous involution of both the primary disease and secondary deposits in the spinal column, and elsewhere, with return of the lost function, and, in rare instances, apparent restoration to health. Therefore, no case can be said to be absolutely hopeless in view of this rather remarkable experience and observation.

in the left pelvis. She walks with a cane and gets about with great difficulty. Upon examination I found her heart, lungs and kidneys negative. Abdomen greatly relaxed and pendulous. Tenderness over gall-bladder. Right ren somewhat displaced. Perineum lacerated to second degree. Uterus markedly infected and cervix lacerated and eroded. Uterus fixed and tender. Several painful hemorrhoids were



WOUND BEING SUTURED. MIDDLE THIRD OF HORIZONTAL INCISION MAY BE, IF NECESSARY, COVERED BY SKIN GRAFTING. IT IS RARELY NECESSARY.

(From Dr. Rodman's Book.)

The following interesting case came under my observation May 6, 1908, and the history detailed below is abstracted from my record. Mrs. R. L. J., Cookeville, Tenn., aged thirty-seven, married, and mother of four children. Has had rheumatism involving left shoulder joint. Has suffered several attacks of abdominal pain, menses normal, bowels regular. Patient suffers greatly with backache and pain

found. Patient has a movable tumor of right breast to which skin is adherent over a small area. The examination being conducted under anaesthesia, the breast tumor was removed by simple incision and submitted to a pathologist for examination, who reported the growth to be adeno-carcinoma.

The patient was at his time in a most miserable state of invalidism both from extreme

nervousness, great pain and discomfort due to her pelvic condition, and on account of her low vitality it was difficult to get her consent to submit to a radical breast operation. On June 3, 1908, with the hope of improving her general condition, I did the plastic work required and removed the hemorrhoids. Under rest and tonic treatment she improved somewhat, and on August 31, 1908, a radical breast amputation was done after the method of Rodman. Perfect coaptation of the wound was secured and in ten days union was complete throughout. She made an uneventful recovery, but continued to suffer with difficulty of locomotion, muscular pains and soreness, which was supposed to be due to rheumatism.

November 26, 1908, while the patient was endeavoring to get out of bed she sustained a fracture of the humerus at its middle, occasioned by the slightest muscular effort. Under appropriate treatment perfect union resulted. This patient came under observation again April 3, 1909, having been confined to her bed for about two months. Now unable to move her body in any direction, with marked kyphosis and evidence of mediastinal involvement. There is no paralysis of the lower extremities, nor interference with the bladder function. Patella reflexe somewhat exaggerated. Today fracture of the humerus occurred spontaneously, without traumatism, which was promptly placed in a fracture dressing, since which time the arm has not been examined. This patient is hopelessly sick and beyond human aid, nothing being done for her except general care and morphine as often as required to contribute to her comfort.

The brilliant achievements of Gross, J. C. Warren, Halsted, Rodman and others in the ultimate cure of mammary carcinoma by early and radical surgical intervention is a matter of common knowledge and the *end results* of a sufficient number of cases seems to warrant the opinion that fully 20 per cent of the cases of cancer of the breast have remained well after the lapse of a sufficient time limit to establish a permanent cure. There can be no doubt but that if these cases are operated upon at the earliest possible time fully 50 per cent should be cured, to remain cured.

There is but one treatment that offers the slightest hope of cure, and that is the earliest resort to a complete operation with the total ablation of a large amount of skin surface, pectoral muscles and fascia, together with the associated lymph glands. The ultimate good results will bear a direct ratio to the earliness of the operation.

Until recently the operation devised by Halsted has been the one of choice, but for several reasons the technique of Rodman is to be preferred. First of all, it is practicaly bloodless. Secondly, working from the axilla downward you avoid the danger of contaminating healthy tissue by the expression of cancer cells. Thirdly, the entire breast is removed *en masse* with the minimum amount of shock and the operation is completed within a time limit impossible for a Halsted, and skin coaptation is usually effected without difficulty, leaving a minimum amount of surface to heal by granulation or subsequent grafting. It is best that the patient should have the benefit of several days' careful prepaartion in the hospital prior to operation, which should consist of that routine usual in all major surgery. It is of the greatest importance to take every possible precaution against infection of the wound, hence the most perfect *ascpsis* should be secured. Rubber gloves and masks should invariably be worn. Ether is the anaesthetic of my choice in this, as in almost all surgical cases.

Rodman's description of the operation which bears his name is so lucid and comprehensive that I cannot do better than abstract and, in part, quote it here.

An incision is begun one inch below the clavicle, which extends in a straight line, ana parallel to the sulcus between the deltoid and clavicular portion of the pectoralis major muscle. This incision should extend well below

the free edge of the great pectoral, and will be five or six or more inches in length, according to the development and adiposity of the chest wall. The incision should not encroach upon the arm, as cicatrices here often seriously interfere with the usefulness of the arm, and not infrequently produce oedema of the limb. This incision exposes the tendon of the great pectoral muscle, and now the index finger of the left hand should be insinuated beneath that tendeon, and caused to emerge at its upper border, whereupon it is divided. (See Fig. 1.) In those cases where the upper hemisphere of the breast is not involved in malignancy, it is the practice of Rodman to remove only the clavicular portion of the muscle. Only a slight dissection is now required to expose the pectoralis minor, which should be clearly identified and separated from its fascia, otherwise the long thoracic artery may be wounded. The index finger is now introduced beneath the small pectoral muscles in the same manner as in the companion muscle above it, the muscle should be lifted, made tense, and divided at its insertion into the coracoid process.

It will now be observed that the muscles have retracted inward, uncovering the axilla, making its subsequent thorough dissection easy. The costo-coracoid membrane is opened and to a great extent sacrificed, which admits of ready access to the subclavicular fat in the apex of the axilla.

The blood supply of the chest wall from above should now be interrupted by ligature of the long thoracic, alar-thoracic, and accromio-thoracic arteries in the order named. This will render the future steps of the operation practically bloodless, it remaining only to catch and ligate the branches in the chest wall from the internal mammary.

The enlarged lymph glands, in fact, all lymph glands and fat of the axillary space should be removed, and in case there is palpable enlargement of the supraclavicular glands they should also be removed. The dissection of the axilla should be so thorough that only the blood vessels and nerves are left, and should invariably be from above downward and never by *piece-meal.*

It now remains to complete the skin incision, which is made by beginning at the middle of the initial incision, and circumscribing the entire breast, with either a circular, oval or broadly eliptical incision. Generally the egg-shaped incision is employed. The knife should not be carried straight down to the muscles underneath, but slanted in such a manner as to divide the subcutaneous tissue or para-mammary fat at least two inches further out than the skin has been cut, which will practically take it near the clavicle superiorly, well beyond the sternum, internally, below the border of the great pectoral inferiorly, or well on to the external oblique and rectus muscles. (See Fig. 3.) This undermining serves two purposes: It facilitates the removal of the greatest amount of fascia, through whose lymphatics *permeation* so readily occurs, and insures approximation of a very large wound.

The breast, with its axillary tail still attached, the pectoral muscles, para-mammary fat and deep fascia are all lifted up on the costal wall, preliminary to cutting the costal attachments of both pectoralis minor and major, which is now done, and the bleeding points from the perforating branches of the internal mammary artery are promptly clamped and tied.

This produces a very large wound (Fig. 4), over the chest the intercostal muscles are exposed, and inferiorly the external oblique and rectus; posteriorly the latissimus dorsi, teres major, subscapularis muscles, and the long subscapular nerve; at the outer aspect of the chest wall, the digitations of the serratus magnus, and the nerve of Bell.

A part of the pectoralis major and minor muscles are left at their origin, which tends to

prevent adhesions of the skin to the ribs, and makes a good bed for planting grafts, if necessary.

"Complete hemotasis is insisted upon, and any vessel of sufficient size to require a ligature is tied, * * * others twisted," slight or extensive oozing can be quickly checked by douching the parts with hot water at a temperature of 120 degrees, and is further beneficial in the event that our manipulations have expresed cancer cells on any part of the wound.

Closure of the wound is effected by beginning at the place where it was started, that is, near the clavicle. Interrupted or continuous sutures may be used. After closing the first incision, the circular or oval portion of the wound is begun at the sternal end, and after advancing one-third the distance between the two extremes of the second and larger incision, it will be easy to tell whether or not approximation of the flaps can be accomplished with facility, if not, the suturing should be stopped at this point, and begun at the other end and carried to the extent of one-third of the incision, the central third of the wound is left unsutured, and is immediately covered by suitable grafts. (Fig. 5.) Drainage may be used if thought necessary; it is perhaps safest in all cases.

Sterile gauze dressings are now applied in such a manner as to obliterate the axillary space, and the arm is bound firmly to the chest wall for twenty-four hours, after which time the arm is no longer confined. The patient may sit up on the third to fifth day, and most cases will have healed thoroughly in ten days unless it has been necessary to make skin grafts, or a part of the wound has been allowed to heal by granulation.

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THE TEACHING OF PHARMACOLOGY IN THE SMALLER MEDICAL SCHOOL

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At the present time when such an evolution is taking place in the medical curriculum it does not seem out of place to discuss the position and importance of pharmacology, and to consider the possibilities for the development of such a course in the smaller medical schools.

The branch of medicine under discussion, when considered in its modern interpretation, has not the prestige of years of active service or the imprint of the hands of many of the masters as is the case with the older subjects such as anatomy and physiology. Comparatively speaking, it is young and needs encouragement and moulding from strong and enthusiastic minds. The subject may be more clearly presented by considering it under the following subheads:

1. The position of pharmacology in its relation to other branches of the medical curriculum.

2. The pedagogical value of pharmacology in developing in the medical student logical reasoning and enabling him to make logical interpretations of experimental facts.

3. The influence of pharmacology upon the mental attitude of the Clinician.

4. The possibility of developing such a course in the smaller medical schools.

The Position of Pharmacology in its Relation to Other Branches in the Medical Curriculum.

In order that the course should fulfill its greatest mission, and be of the most value to the student, it should not be given until the student has completed his work in anatomy and chemistry and is fairly well advanced in physiology and pathology. Without a clear-cut knowledge of physiology and a proper amount of training in experimental physiology, the student cannot properly interpret the results he obtains when drugs and other agents are introduced into the physiological body. Wihout a knowledge of pathology, the experiment which he performs in the pharmacological laboratory is simply an experiment to obtain a certain result which he has been taught to expect. This is the end of it. It has no application and no definite connection with the relief or modification of morbid states.

With a knowledeg of pathology the average medical student at once couples up his experimental results, we may say in raising arterial pressure, with the influence which such a procedure would have upon a state of high venous pressure and passive congestion. He is enabled to see the influence which some drugs have in conditions of perverted physiology and he sees it from a sound pathological basis which will prevent him from being too sanguine and from indulging in therapeutic flights.

It would be perhaps unwise for the course to be given too late in the curriculum. In the first place, after the first part of the third year the student needs the knowledge which he should have acquired in pharmacology in the study of the clinical branches. Secondly, at this part of his course his mind is intent upon the clinical side and he will almost invariably neglect the laboratory side for the now more interesting clinical branches. It would seem proper for the course in pharmacology to be given in the latter part of the second year or

early in the third year. With such an arrangement it serves as a bond of union between the first two years, which are so largely theoretical, and the last two years which deal to a greater extent with the practical and clinical side of medicine. It would tend to prevent the divorcement of the clinical from the theoertical and of the laboratory from the practical. Such a separation hinders the development of clinical medicine and narrows and restricts the usefulness of the laboratory.

The Pedagogical Value of Pharmacology in Developing in the Medical Student Logical Reasoning and in Enabling Him to Make Logical Interpretations of Experimental Facts.

With the average medical student the greater part of the first two years of medicine consist in a process of "cramming," or memorizing under high pressure. He learns without rhyme or reason that the palmaris longus muscle arises from a certain point, has a certain type of belly and tendon and is inserted at another point. Also, that lead occurs as a sulphide in nature, has certain chemical and physical characteristics, from it certain preparations are obtained, and at this juncture one type of pharmacologist appears and states the dose and action of such preparations before and after absorption.

With a year or more of this type of training the student has either developed a fair memory and knows dogmatically a few things, or if he belongs to a large class of students who do not rely upon their memory he has hazy, indefinite ideas, which he cannot collect and concentrate, and with which he is hopeless, so far as formulating logical conclusions are concerned.

It is intensely interesting to study the development of this last type of student when he is beginning to get a rather firm grasp on physiology, pharmacology and pathology, but only when the first two subjects are approached through a laboratory where live things are being handled and studied and where the last subject is approached with a due consideration of pathological physiology and not purely from the cytological side.

This type of student sees things and does things and at once asks the reason why. If he is being properly instructed he has the opportunity for finding out the reason why, and in a way which he never forgets. Such instruction means much to him, from the consideration of his development. He has wondered, he has put into action his several powers of observation, and he now has certain results from which he can formulate conclusions.

Frequently the brilliant student of the first year whose memory was acute, at this stage of his training is found wanting, and he must either develop a saner and a sounder type of mind or stand aside for the reasoner.

The value of pharmacology for this type of training can be well appreciated, as it is just emerging from a period where it was taught in a dogmatic fashion, to one where a few necessary facts are given the student which he must verify, and at the same time he is given an opportunity to make an abundance of observations which to him are original.

Only a few years ago in many of the medical schools of this country the student learned that digitalis was obtained from the dried leaves of digitalis purpurea, that it was a "heart tonic," that it slowed the rate of the heart and raised blood pressure. "Heart tonic" sounds well, and likely remained with the student and helped to develop that type of medical man who gives digitalis for a fast heart and calomel for that pathological entity, an "enlarged and congested liver."

Contrast with this method the development of a mind that carefully records the heart rate, respirations and blood pressure of an anesthetized animal, that administers to the animal digitalis and observes that the rate of the heart decreases and that there is a rise in arterial pressure, that sees these things and wonders why they occur. If atropine be given, the

rate of the heart increases, and he likely knows that this drug throws out of activity nerve endings. He naturally thinks of what nerve endings atropine could so depress as to quicken the rate of the heart, and reasoning from experiments in physiology he thinks of the vagus, stimulation of which now fails to slow the heart. The student has learned by a series of observations and by deductive reasoning a part of the action of two important drugs and at the same time he has begun to develop an inquisitive mental attitude and a fondness for logical thinking.

The Influence of Pharmacology Upon the Mental Attitude of the Clinician.

The ultimate aim of any system or type of training is to develop a more nearly perfect and ideal finished product. The element which is most often found lacking in both old and young medical men, and which prevents their daily work from being a source of training and development, is a lack of a definite and perfectly well understood mental state which we may call the scientific attitude. The lack of this attitude is most conspicuous in the internist, for the problems with which he is dealing are often obscure, and to say the least are far less tangible than those problems which confront the surgeon. The birth of this mental state must take place early in the student's training, so that it may exert its profound influence upon his future medical growth and enable and prepare him to approach the clinical problems of the third and fourth years with this attitude, which, if developed now, will be inseparable from him in his future work.

In an attempt to obtain this type of medical man there are two courses which would do much to bring about the desired result. First, a coupling up of physiology and pathology by a course in pathological-physiology, and, secondly, a laboratory course in pharmacology, where the student actually observes and determines the usefulness and uselessness of various drugs and other remedial agents.

To such a student a lobar pneumonia would no longer mean the solidification of one or more lobes of a lung by an exudate of a definite histological structure. He would at once interpret,. or at least make an attempt to interpret, the accentuated pulmonary second sound, the strong, forcible apex beat, and would note the difference in character between the first and second sounds of the heart. Later in the disease, when likely the pulmonary accentuation is diminishing, and the first sound is aproaching in character that of the second, if he has actually handled drugs and animals together he will hardly give aconite or veratrum to slow the "excited heart" or strychnine to bring to a state of fatigue overstimulated nerve cells. Some drug, perhaps digitalis, which would give more nutrition to overworked heart cells and which would act directly upon this organ so as to prevent an impending dilation, would naturally, from his training, be foremost in his mind.

The analysis and criticism of patent and proprietary preparations has done very much to restrict their use by physicians and by the public. The surest way to continue this work is to create medical men who have a proper understanding of the indications, and of the limitations, of drugs. This can certainly be best accomplished by. allowing the student to handle the drug and the animal into which it goes.

The Possibility of Developing a Modern Course in Pharmacology in the Smaller Medical Schools.

The development of such a course depends primarily upon the intensity of the desire on the part of the instructor to aid in turning out better medical men. And, secondly, it depends upon the appreciation of animal work when it is carefully and accurately done by the student.

The financial consideration is amazingly small, especially in those schools which give courses in experimental physiology. In such schools mammalian experiments are frequently not given. Granting this to be the

case, in order to give mammalian work in pharmacology, the additional apparatus for a class of forty which is divided into two sections, would consist of five operating boards, five mercury manometers, five burets and stands, and five perfusion bottles. The glass canulas can be easily made and the rubber tubing for connections will cost only a small sum. For perfusion work on the mammalian kidney, which is highly instructive and greatly appreciated by the student, it is advisable to have a series of flasks of different sizes to contain the various perfusion fluids. The flasks can be dispensed with and glass funnels used. The flasks, oncometers, water manometers and tubing for these experiments can be obtained for about $25.00. The mercury manometers, burets and stands, operating boards and tubing will not cost over $30.00. The total outlay for apparatus in such a course, which is not as comprehensive as it should be, will be within $60.00.

It is not at all ideal to have to use the apparatus belonging to another department. It predisposes to conflicts, it tends to create confusion, and lastly, an accurate record cannot be kept of the apparatus when several groups of studuents have the handling of it and are presumably responsible for its good condition.

In the larger cities it is fairly easy to obtain the dogs necessary for this work from "dog catchers" and the city pound. At institutions located in small towns this source of supply is wanting. It is astonishing how rapidly dogs develop the habit of sucking eggs and catching chickens when it has become known in the community that they are selling at fifty to seventy-five cents a head. Not only this, but the number increases from year to year.

In the course refererd to it was necessary to have twenty-six dogs and sixteen rabbits. The dogs were easily obtained at an average cost, including their board until the time when they were used, of -1.00. The rabbits can be bought from local dealers as they are needed for fifty cents a piece. The total outlay for animals, and this of course would occur each year, would not be over $34.00.

When giving such a course it is necessary to have a place where the animals can be cared for before they are used. In many of the smaller schools which are fortunate enough to have a modern laboratory building this is of course provided for, and frequently the provision is very poor. In our work a small house was constructed 15 feet long, 10 feet wide, and with a pitch of 6 feet. Surrounding the house was a small lot enclosed by wire with a mesh of about 2 inches. Such a dog house, which is perfectly satisfactory, can be constructed for $35.00. If the animals are given room for exercise, fed once a day and the sexes kept separate, they cause very little disturbance.

Such a laboratory course in pharmacology of forty hours, which includes the use by the students of frogs, turtles and the higher animals, can be given anywhere by an expenditure of not over $60.00 a year. Provided the physiological apparatus is used, the initial exepnditure for other necessary apparatus and the construction of a simple dog house, need not be over $100.00.

The value of such a laboratory course, simple as it is, is difficult to overestimate. Short conferences with each group of men concerning the experiments and the results obtained gives the instructor a chance to study each individual in the group and aid in the development of the weaker members. The operative work gives the men an insight into operative technique. Lastly, it trains them to observe closely, to make accurate records, to seek for the reason, for results and creates in them an enthusiasm for investigation and scientific medicine which must do much to direct them in their future work.

THE DIFFERENTIAL DIAGNOSIS AND TREATMENT OF OCCUPATION AND OTHER PARAKINETISMS OF ORGANIC AND PSYCHIC ORGIN

BY TOM A. WILLIAMS, M.D., C.M., Edinr., Washington, D. C.

Both surgeons and practitioners are sometimes in doubt as to whether to operate upon a patient showing spasmodic movements of the neck (torticollis) or face (tic).

It is only within the last years[1] that clear clinical differentiation has been possible between the movements caused by the irritation of a reflex arc (spasm) and the movements dictated psychogenetically (tic), *i. e.*, by some definite perception, idea, volition.

For the latter operation is eminently undesirable; for any suggestive effect it may have only reinforces the patient's preoccupation with the deranged locality, without creating the psycho-motor discipline, which is the only means of removing the morbid movements.

On the other hand, the true spasms are most amenable to surgical intervention, and psychotherapy is entirely without effect upon them. Thus it becomes of the first importance, before instituting treatment, to be quite certain of the correct diagnosis. As these movements may affect not only the face and neck, but any muscles of the body, I resume in a table their general characters. Even these are sufficient to differentiate the varieties resumed, but a short discussion of some local peculiarities, where the face and neck are the localities concerned, will render still more evident the distinction which permits the clinician to institute surgical or psychotherapeutic measures as the case may require.

SPASM.	TIC.	CHOREA.	CEREBELLAR AND RUBRO-SPINAL TREMOR.
Sudden, resembling electrical stimulation.	Brusque and brief, slower.	Still slower.	Not sudden but regular and increased by movement.
Rythmic and synchronous or in lightning waves of same movement.	In volleys of similar movement repeatedly.	Irregular, not synchronous.	
	When tonic, distinguished from stereotyped act by absence of catatonic aptitude.	Extreme variability in movement with tendency to unilaterality.	Similar oscillations.
Muscles often enfeebled.	No weakness, often hyperkinetic hypertrophy.	Myasthenia hypotonia.	Myasthenia, hypotonia or the reverse.
Exaggeration of reflex concerned only.	Reflexes normal.	Reflexes often modified.	Reflexes increased.
Distribution of peripheral nerve.	Locally conditioned by an idea.	Laterality.	Laterality or not.
Often painful, always distressing. No craving.	Painless.	Sometimes painful.	Never painful.

Persists in, and may interrupt, sleep.	Tic disappears in sleep.	Sleep interfered with.	Disappears in sleep.
Purposeless.	Pseudo-coordinate, intentional act.	Purposeless.	Purposeless.
Irreproducible voluntarily, unmodified by volition or emotion.	Influenced by emotion or volition, but impulsive and followed by satisfaction, always arrestible (leaving no trace) by a subterfuge, a neutralizing act ineffiacious mechanically or physically, but effective physically; also variously by solitude, distraction, position, etc.	Uncontrollable by will, aggravated by emotion.	Cease at rest.
Various aetiology, but generally peripheral irritation—*e. g.*, trigeminal neuralgia (which is not a true tic).	Psychasthenic character. Similar heredity, but always first generated by a determining stimulus; it is the sequel to the unhindered repetition of a once voluntary purposive act, becoming an impulsive obsession.	Acute rheumatic diathesis, probably bacterial. No similar heredity.	Various, neoplasm.

Thus, if the motor reaction is consecutive to pathological irritation at any point on a bulbo-spinal reflex arc, it is a spasm.

If the cortex is, or has been, involved in its production, it is not a spasm.

Should it present in addition to the fact of cortical participation, the aforementioned distinctive pathological features, it is a tic.[3]

Jacksonian convulsions, hemiathetosis, and the tremors preceding or following hemiplegia are all easily differentiated from both spasm and tic by accessory characters well known to every nerologist, which need not here be discussed.

This kakoethes which invariably precedes the explosion of the true tic, ranges it among physiological acts, all of which, when postponed beyond their due period, cause intense desire for their performance which is followed by relief, just as is the tic. It is, however, a physiological act perverted; for it is ill-timed, being edpendent upon no adequate stimulus, mate comfort, and being beyond the power of inhibition by the patient's enfeebled will, which evidences itself, as a rule, by other stigmata of the psychasthenic state. Into these I cannot enter here save to mention the scrupulosities, timidities, feelings of inadequacy, desire for peculiarity as well as the want of correspondence of the emotions with the real situation, showing itself by intense joy or sadness over trifles, the morbid fears, and the painful anguish, sometimes indeed apropos of nothing, which such patients exhibit.[3] The arousing of this last symptom when the patient tries to suppress the tic is pathognomonic, differentiating it from a true spasm.[4] The following cases illustrate these points:

A middle-aged woman was seen by the writer with Dr. J. S. Lamb, of Washington. About two years ago, the affection began with slight, short twitchings of the left orbicularis. These became intermittently more extensive until the whole face is now affected. Sometimes they cease for weeks at a time, and then return very violently. They are aggravated by cold air, speaking, eating and emotion; but are not in the least arrested by the most powerful efforts of the will, or by distraction, or

concentration of attention elsewhere. While not invariable in extent, the hyperkinesis never transgresses the domain of the seventh cranial nerve. It in no way resembles a co-ordinated act, though the opposite orbicularis sometimes participates slightly. This is due to bulbar overflow of the reflex; for though the patient is a nervous woman, has become more so since her affliction, yet the movements are independent of this nervousness. They are accompanied by an uncomfortable sensation, and tears sometimes flow during the spasm; but there is no pain. She is not sure whether they persist in sleep.

This is an example of true facial spasm curable by interuption of the reflex arc by section of the nerve with the knife or its destruction by injection of alcohol or other means. In some cases these movements appear to rise from irritation of the sensory arm of the arc. Pain is then a prominent feature, as in the erroneously called tic douloureux of the face. The treatment of this is now well-known, but it is not so well known that the radical extirpation of the Gasserian ganglion should not be undertaken until the peripherial nerve trunk of the painful area has been blocked by the injection of cocaine or one of its derivatives;[5] for if this procedure suppresses the pain, it is evident that the irritation cannot be in the ganglion, but must be peripheral, in which case a simple destruction of the nerve trunk will cure the patient without recourse to the risky and otherwise incommoding intracranial operation. Even the knife need not be used, for Schloesser's method of injecting alcohol near the foramen rotundum or foramen ovale has, in the hands of Levi and Bedoni[6], given splendid results, with rare and not serious inconveniences. Contrast the following case:

One day in June, 1900, the patient experienced a feeling of discomfort in the articulation of the lower jaw, the sequel to a slight alveolo-dental periostitis in the neighborhood of a bad tooth, and interpreting the sensation as a new and grave symptom in the march of his malady, forthwith proceeded to investigate its development by playing with his maxilla. Then ensued a perfect debauch of masticatory movements, in which agreeable repetition of every conceivable grimace was joined to protusion and retraction of the jaw in the search of articular cracks. He became so wholly preoccupied with this tic of mastication that ere long he had begun to pinch the mucous membrane in the inside of the right cheek, between the hindmost molars; and this fresh object of absorbing attention, in its turn, led quickly to some excoriation of the mucosa on both sides. No halt was called by the lower jaw to give the abrasions time for repair, with the natural outcome that they suppurated and paved the way for an attack of infective stomatitis, with pain, fever and malaise, which necessitated the application of the thermo-cautery to the ulcerated areas for its relief. (Meige.)

It is very evident that although serious organic lesions occurred in this case, they originated from the purposive movements voluntarily inaugurated, although they passed out of the patient's control on account of his weak will. The Psychogenesis is manifest, as is the beginning in a sensation of discomfort and the desire to remove it. The movements were, however, unnecessary and ill-timed. It was a true tic.

A case in which the psychogenesis could not be elicited is that of a Russian boy of eleven seen by the writer at the George Washington University Dispensary in December, 1908 (Dr. Frankland's service):

The patient declares that ever since the age of five he has felt the need of periodically turning his head abruptly to the right every few minutes. He experiences no intense desire to do this; but as he never attempts to inhibit the movement, and performs it at least every few minutes, he gives himself no opportunity to develop angoisse. He presents no other neuropathic stigmata, having neither scruple timidities, aboulias nor feelings of inadequacy, morbid fears, nozmonomanias, although he occasionally day dreams, but what boy of his age does not? The movements are short, but not "electric," but they often occur in volley. They are such as could be reproduced volitionally. They are painless; disappear with sleep. However, no conditioning idea could be elicited, as he is entirely unaware how he began the movement, saying: "It just comes." The movements are more numerous when he is perturbed; and have never been influenced by any neutralizing subterfuge, none having been tried. They consist of sudden turning of the chin over the right shoulder, sometimes accompanied by its elevation and that of the shoulder, and a twitching of the face, more especially the lips.

So it is very evident that the spinal accessory nerve alone could not perform such a movement, and it is inconceivable that a local irritation could comprise the facial nerve, the spinal acecssory and all the nerves of the cervical plexus without having some effect upon contiguous structures and implicating the phrenic nerve as well. It must therefore be cerebral. The question whether focal or psychic is answered by the test of voluntary inhibition of the movements, and I found that by maintaining his attention firmly to follow with his eyes the movements of my slowly moving finger, fixing it intently and vividly, that I was able to entirely suppress the movement, first for a space of thirty seconds and later for periods of increasing duration. I then impressed upon him the power of his own will in suppressing the movements, and he was ordered to come to the dispensary every day for treatment, which consisted of the psychomotor discipline of fixing with his eyes slowly moving and stationary points for longer and longer periods under the supervision of Messrs. Page and Buckner, two of the students in the dispensary. He supplemented this by similar exercises at home, and at the end of ten days the tic was under such control that he made the movement only twice daily. At the time of writing he is cured, several days passing without tic.

A case of tic which might be considered an occupation neurosis is the following:[8]

A man of forty years worked in an office from 7 A.M. to 8 P.M. He wrote with head and body turned to the left. After a series of worries and troubles he noticed an excessive twisting of his head to the left on writing; later this rotation began to occur during reading, eating, buttoning his boots, etc.; later still it became incessant except when he lay down or supported the head. Moreover, the twisting of the head much interferes with his office work, and he has the greatest difficulty in writing.

Suggestion is often a marked factor in the inception of occupation neuroses. In so far as the symptom is thus caused, it conforms to the definition of hysteria promulgated by Babinski[10] and discussed elsewhere by the present writer,[11] "susceptible of production by suggestion and removable by suggestion-persuasion." The importance of a psycho-analysis to reveal the hidden suggestions which may be at the root of an occupation neurosis should not require emphasis, for it is a waste of time to treat as a neurasthenic a patient exhibiting a psychogenetic symptom which can be removed only by psychotherapy.

"A girl was brought to Babinski having become monoplegic upon receiving an electric shock while crossing a tramway line. This seemed like paralysis not caused by suggestion, but after the symptom had been removed by persuasion, further inquiry elicited the fact that the patient had overheard some months previously a conversation between some electricians who were speaking of the dangers arising from electric shocks of the above description. It is evident that upon experiencing the shock there had flashed into the patient's mind a datum learnt from the conversation she had overheard and apparently forgotten, and that this memory furnished the suggestion at the base of the palsy she developed."

This case is purely psychogenetic, but the printer's disability is very largely due to fatigue, intoxication and mal-nutrition, and is to that extent neurasthenic. The criteria for the differential diagnosis of neurasthenia are elsewhere[12] discussed at some length, and I hope that the present paper indicates sufficiently clearly the marks of psychasthenia. The removal of the psychasthenic para-kinetisms is accomplished by psycho-motor discipline in combination with the simplification of the patient's psychic life, in order that his attention may not be fatigued when it is required for psycho-motor exercises. Of the surgical treatment I have already spoken.

Thus I have endeavored to indicate the characters which permit of positive diagnosis of three types of parakineses, without which successful treatment is a mere haphazard.

To sum up (1) the lower reflex arc irritation is focal, and is curable only by surgery,

radical when the lesion is ascertainable, or palliative when nerve or ganglion is destroyed or paralyzed. (2) The hysterical parakineses are psychogenetic by suggestion, and are cured by removing the false fixed idea by suggestion and persuasion. The constitutional tendency to acquire false, fixed ideas must, however, be removed by re-education. Sometimes, moreover, a physical dyscrasia causes the recurrence of psychic states favoring suggestibility, and requires attention. (3) Also psychogenetic, are the parakineses of psychasthenics. But they are mere episodes among the vastly more important intellectual and emotional insufficiences of these patients. Their tics can be removed by psycho-motor re-education, but the psychopathic ground work remains, though it can be much ameliorated by a wise physician who is able to teach such patients their limitations, demonstrate their excellencies, and show them how to make the most of themselves. The modern psychotherapist is a living refutation of Hamlet's pessimistic query, "But who can minister to a mind diseased?"

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LUNG PUNCTURE AS A THERAPEUTIC MEASURE

BY T. J. COBLE, M.D., Shelbyville, Tenn.

This line of treatment is indicated when you have a hepatised lung, in a sub-acute condition, following pneumonia, when there has been a faulty resolution, and a failure on the part of nature to clear up the lungs.

This line of treatment is especially indicated in an asthenic patient, that is, very weak, and much debilitated, for in this class of patients the circulation is very poor, and your absorbing power very much below par.

This puncture is preferable to blisters in these conditions for the following reasons:

First.—It is more certain and much quicker, for the reason that this is a chronic or a sub-acute inflammation, and to hope to get resolution is by increasing the blood supply, or, in other words, develops an acute inflammation out of the chronic, and thereby stimulate nature to complete its work.

And I know of no way that it can be done as effectively as with a simple puncture of the lung.

Second.—The puncture is practical, and without pain or danger to the patient.

Third.—With the puncture your irritation is in the lung, or the seat of the disease, and with the blister it is on the chest wall, and does not increase the blood supply where it is needed.

Fourth.—After the puncture of the lung, resolution usually takes place in from three to ten days, and your patient is relieved of the necessity of taking the nauseating absorbent mixtures that are usually prescribed, such as the iodides, bichlorides, etc.

This puncture must be done aseptically, as any other surgical operation.

I use a large aspirating needle; in the first place because I always have one, second, on account of the convenience of using the syringe as a handle. A hat pin would suffice.

You may select any locality that is admissable for the asperation of the plural cavity.

I usually prefer the mid axillary line, and after thoroughly preparing my field of operation and my needle, I freeze the parts with ethel chloride, with the patient either in a lying or a sitting posture.

I puncture the chest wall, as though I were going to asperate a plural cavity, except that I plunge the needle into the lung structure, then withdraw the needle from the lung, changing the position of it, without removing it from the plural cavity, then plunge it into the lung again, in this way pncturing the lung in three or four different places, with only one opening externally, then remove the needle and cover the puncture with colodion.

I have used the puncture in at least a dozen cases, with good results in every instance, and with no untoward result whatever.

I will report the first two and the last case.

First—Floyd H., a boy eight years old, whom I attended in May, 1898, with pneumonia.

He was a delicate boy. The pneumonia ran the usual course for the first week, but afterwards developed the sub-acute form, leaving him with a hepatised lung.

After treating him for thirty days with blisters, iodides, and other absorbents, the lung was still in a solidified condition, and the boy was very weak and much emaciated, temperature ranging from 99½ to 101 degrees; resperation about thirty; circulation from 110 to 120.

I had despaired of his life, and after a consultation with my father, the late Dr. N. B.

Coble, we decided to asperate the lung, with the result that the boy's lung cleared perfectly in the short space of one week's time.

His convalescence was very rapid, he made a complete recovery, and has been in fine health since.

Second—Mrs. S. S., aged 24, previous health very good, family history decidedly tubercular, her father, brother and sister having died with tuberculosis.

I was called to see her in June, 1899, and found pneumonia with evolvement of the two lower lobes of the right lung.

The patient ran a similar course as case No. 1, developing a sub-acute form.

The lung would not clear up, and after pursuing the regular line of treatment for about six weeks, without any beneficial results whatever, I had consultation, and we decided to puncture the lung.

The result was that the lung cleared entirely within ten or twelve days' time, complete recovery followed without interruption, and the patient is in fine health to-day.

Third—A young man 23 years of age was bookkeeper in the office of the N. & C. R. R.

He was seen by Dr. Marr, of Nashville, Tenn., in March, 1907, who diagnosed the case tuberculosis, located in the apex of the left lung.

Microscopical examination by Dr. Litterer confirmed the diagnosis.

I saw him for the first time in April, 1907, and confirmed Dr. Marr's diagnosis.

I was called again to see him in May with pneumonia in the lower lobe of the left lung.

The case ran the usual course for the first week, then developed the sub-acute form, as in the two cases already reported.

The diagnosis was confirmed by microscopical examination, by Dr. Litterer, both pneumonia and tuberculosis.

He had had several hemorrhages before contracting pneumonia, and he had a number during this attack, which shows the rapid progress of the tuberculous condition.

The upper lobe showed the tubercular deposit, and the lower was left in a hepatised condition.

I hesitated to puncture the lung on account of the tubercular condition, for fear that I might produce an abrasion, and thereby open a fertile field for secondary involvement.

I discussed the case with several of my colleagues, but they all rather discouraged the idea of my puncture operation, and advised the usual routine treatment.

So I used several blisters and gave him the iodides for about ten days, without any appreciable results, then decided to shoulder the responsibility and puncture the lung anyway, feeling confident, in view of my previous experience, that I could not fail to get good results.

This I did, and without any appreciable pain at the time of the operation.

But during the operation I allowed the escape of some air into the lung and produced some slight emphysematous condition, causing a cracking sound which produced some pain, and great anxiety to the patient, but was relieved with five grains of dovers powders, and the reassurance to the patient that he was all right.

The condition disappeared in twenty-four hours, with no other unpleasant symptoms.

The lung was perfectly clear in ten days, and that lobe of the lung has been perfectly clear ever since.

I then took up the treatment of the tuberculosis, had him a room built of gauze wire, on the south porch, and had him sleep in it at night, and he is still sleeping there, and has ever since, except a few of the extremely cold nights of last winter.

His medical treatment has consisted of carbonate creosote, tonics and nourishing diet.

His general condition has improved in every respect; his lung has cleared up, his cough has checked, his appetite is good, color fine, and his strength is about par.

He has gained in flesh from one hundred

and twenty pounds, to one hundred and fifty, weighing more now than ever before.

His normal weight in the past was from one hundred and forty to a hundred and forty-seven pounds, and he now looks the picture of health.

We have not had a microscopical examination made in a year, but every general symptom is good.

I have given this case more in detail on account of the tuberculous condition, showing that puncture is admissable even in extreme conditions.

In conclusion, will state that I have not tried this puncture treatment in a solidified lung of a tubercular origin, but think that in well selected cases it would prove beneficial and worthy of consideration.

TREATMENT OF TETANUS WITH ESPECIAL REFERENCE TO USE OF MAGNESIUM SULPHATE

REPORT OF CASE.

BY GILMAN J. WINTHROP, M.D., Mobile, Ala.

The development of modern aseptic technic and the more exact knowledge of the characteristics of bacillus tetani have undoubtedly resulted in a marked decrease in the prevalence of tetanus. Tetanus, however, still frequently confronts the profession, and, with a mortality variously estimated as 75 to 95 per cent in the acute cases, it must be classed among the most fatal infections with which we have to deal.

The experimental production of the disease in 1880 by Sternberg[1] by the injection into animals of earth and gutter water, and by Carle and Rattone[2] by the injection of pus from human tetanus, lead to the discovery by Nicolaier[3] in 1885 of the causative agent—bacillus tetani. The further work of Kitasato[4] and later of Breiger,[5] of Meyer, Tiberti and others have furnished knowledge of the bacillus and its poisons which give us a rational basis for our modern therapy.

The production in 1890 by Behring and Kitasato[6] of an antitoxin and the further work of Tizzoni and Cattini[7] mark the first great steps in the treatment of tetanus. The curative value of antitoxin in developed cases is still *sub judice*, but its prophylactic worth is undoubted.

The symptoms mark the disease as essentially one of irritation of the motor neurones of the spinal cord. In the absence of a specific curative agent the remedies thus far proposed and employed have for their disideratum the combating of the tonic spasm and clonic seizures, thus preventing fatal involvement of respiratory and cardiac muscle, and granting to the body cells time to combat the intoxication by their various protective agencies and to allow of the neutralization of circulating toxin by antitoxin.

The treatment of tetanus may be properly discussed under three heads: (1) Local treatment. (2) Serum therapy. (3) Sedative agents.

Local Treatment.

The anærobic character of bacillus tetani, its great resistance to destructive agents and the localization of the organisms at the point of infection make the thorough treatment of the seat of infection one of cardinal importance. Infection commonly follows deep punctured wounds and those lacerated ones in which the folding in of overlying portions of tissue or the formation of a coagulum produce in the depths of the wound anærobic conditions favorable for the growth and multiplication of the bacilli. The incidence of tetanus after "Fourth of July" injuries is graphically shown by the statistics compiled by the "Journal of the American Medical Association" for the past few years.

Punctured wounds should be freely incised, curetted and thoroughly cauterized with tincture of iodine, carbolic acid or silver nitrate and loosely packed with gauze to prevent closure and to assure free access of air to all parts of the wound. A weak mercuric chloride solution or 1 per cent carbolic acid solution is then applied and the wound dressed daily for seven to ten days. The packing should be removed and replaced anew for at least five days to permit thorough aeration of the injury. Gunshot, blank cartridge and lacerated wounds, in which particles of cloth-

ing, wadding, or other foreign bodies are frequently introduced, must be most carefully cleansed, and this is only possible after free and deep incision exposing fully all parts of the traumatized tissue.

Lambert[8] has shown that spores of tetanus bacilli are killed in ten minutes by a 1-1000 mercuric chloride solution; in one minute by a 1 per cent nitrate of silver solution, and in 10 minutes by a 5.5 per cent carbolic acid or 0.5 hydrochloric acid solution.

Objection has been raised[9,10] to the use of the strong caustics or to the application of the actual cautery on the ground that they produce a coagulum of albumin or form a scar over the wound surface, thus preventing access of air. Preference is stated for continuous bathing of the wound with weak antiseptic solutions as 1.5 to 2 per cent carbolic acid, 1-1000 silver nitrate, or 1 per cent iodine trichloride solution.

The use of the stronger caustic agents is still rather general, and if followed by a wet dressing of weak mercuric chloride or carbolic acid, which will pass by the drain to practically every part of the wound, is entirely efficacious. Iodoform gauze, due to its iodine content, is preferred by some authors for drainage and dressings.

McFarland,[11] on experimental grounds, advises the local use of dry antitoxin powder, and states that it not only neutralizes the toxin as it is formed in the wound, but also the circulating toxin. It has not been sufficiently employed to permit of final deductions. Kinyoun[12] speaks most highly of its use, and thinks that besides its antitoxic properties it probably exerts a further action of the nature of an immune body. Encouraging reports have also come from its use in connection with the so-called "ice treatment of tetanus." It should not be used to replace the aseptic treatment of wounds, but as a dressing after thorough use of local antiseptics promises much, especially when combined with antitoxin injection.

Serum Therapy.

The toxic products elaborated by bacillus tetani belong to the group of soluble or extracellular toxins. Brieger[13] isolated from impure cultures two toxic substances—tetanin and tetanotoxin—which were fatal to animals in very small amounts but did not produce typical symptoms. Fraenkel[14] and Kitasato[15] later separated a toxalbumin of high toxicity and proved the existence of two distinct principles—tetanospasmin and tetanolysin—the first producing the typical spasms and the second a marked destruction of erythrocytes.

The poisons elaborated by the living, intact bacterial cell, at the site of invasion, pass to the motor end-plates and entering the motor nerve fibers travel by the nerve protoplasm to the motor neurones of the spinal cord, and become anchored to these cells.[16,17] This combination or affinity of nerve cell protoplasm for toxin cannot be replaced by antitoxin affinity. Toxin once fixed to cell is not exchangeable or combatable by any amount of antitoxin. Antitoxin, therefore, to be efficacious, must reach and combine with toxin before it is fixed to the motor neurone, and probably even before it enters the nerve trunks.

The period of incubation or the time between infection and the onset of general symptoms is attributable, in part, to the time required by the bacilli to produce poisons, partly by passage of toxins from the site of the initial lesion to the motor nerve and its further extension to the spinal motor ganglia. The period of incubation is generally stated as five days to two weeks, most often seven to nine days, in the so-called "acute cases," while in sub-acute or chronic tetanus, it may vary from two weeks to a month or more.[18] Anders and Morgan[19] in an analysis of 858 cases found 194 cases developing within five days, 394 cases in 5-10 days, 148 in 10-15 days, and 98 in 15-25 days. In this series 23 cases developed in one day or less. Two cases are noted as developing within 10 and 15 hours of the initial trauma. Other cases with short incuba-

tion period are reported by J. Adams[20], seventy and possibly sixty hours, and Tyrrell[21] reports a fatal case developing within 72 hours after a compound fracture of the tibia. Cases of long incubation are recorded by Vaillard[22], 13 weeks, and Adams and Morgan,[19] 100 days. Fowler[23] suggests that the incubation period depends on the number of bacilli introduced, the location of point of infection, and "the capacity of the different tissues to yield the ptomains under the influence of the bacillus."

Donitz has shown, experimentally in animals, that early prophylactic doses of antitoxin produce a longer incubation period and milder symptoms if the attack is not entirely aborted. He states further that the amount of antitoxin necessary to prevent an attack must be rapidly increased in proportion to the time since infection. To exercise its prophylactic action antitoxic serum must reach and combine with toxin before it is anchored to the motor ganglia of the cord. To this end antitoxin must be administered within a few hours of the receipt of the injury.

As a prophylactic measure the serum is most often given subcutaneously or intramuscularly, in back, loins, thigh or buttocks. Injections are preferably given in the neighborhood of the wound or of the motor nerves from the wounded area. The average prophylactic adult dose is 10-20 C. C. when administered immediately following the injury. Subcutaneous and intra-muscular injections have, when given early, proved fully efficient.

When some time has elapsed since the receipt of the injury and especially if tetanus bacilli have been demonstrated in the wound we must consider the advisibility of intravenous administration of the antitoxin as recommended by Rogers.[24] Subcutaneously the serum is but slowly absorbed, and it is imperative in these cases to bring the antitoxin in contact with toxin as rapidly as possible. Rogers further advises the injecting of antitoxin in the vicinity of the wound. The intravenous dose is about 10-15 C.C. Large subcutaneous or intravenous doses are advisable in cases where the trauma is extensive and in those contaminated with soil, fæcal matter, etc.

Vaillard[25] and others have proven that antitoxin is rapidly eliminated from the body in the secretions and excretions, and ordinary doses confer immunity only for a week or two at most. They advise that prophylactic doses be repeated at least each week for three or four weeks.

The value of antitoxin serum as a prophylactic measure is now generally conceded, and those few cases in which it has apparently failed to protect are due to insufficient dosage, late administration, and, not infrequently, to poorly prepared and poorly standardized serum.

The curative value of antitoxin after the onset of general symptoms is as yet not fully determined. While antitoxin cannot effect fixed toxin it can and probably does neutralize any further toxin which is formed at the locus of infection, where local treatment has been incomplete, and so protects those nerve cells not or only partially saturated with toxin. The serum is entirely harmless, and should be administered in large amounts, and frequently throughout he course of the disease. Subcutaneous or intra-muscular injection of 15-25 C. C. every four or five days is sufficient in the sub-acute cases, but in the severer forms intravenous injections of 10-15 C. C. is to be preferred and should be given at least weekly.

Rogers[24] has popularized the intraneural injection of antitoxin. He claims that the antitoxin is not taken up by the nerves and so only the toxin at the point of infection and that free in the blood and lymph can be neutralized by subcutaneous, intra-muscular or intravenous injection. Intraneural injection, on the other hand, will block the extension of toxin up a nerve toward the ganglia. He advises also that the spread of toxin up the cord be blocked by lumbar puncture and injection of 10-20 C. C. of antitoxin into the cauda equina. If the toxin is extending further up-

ward and affecting the vital medullary centers he favors antitoxin injection into the cord, at the level of the sixth or seventh cervical certebra, to prevent further involvement of these areas. In other words, Rogers favors bringing together the toxin and antitoxin in blood, lymph, and at wound site by intravenous injection; preventing the extension of the poison up the nerves by intraneural injection and likewise blocking that brought to the cord, by other motor nerves of the body, by blocking the cord low and also high up if necessary. Rogers article deserves most careful consideration, and the cure of three out of seven cases argues much for his treatment. Subdural injection to be efficacious must enter the motor fibers (cauda equina) or these fibres must be so wounded as to permit of the entrance of antitoxin. If simply placed below the membranes it passes quickly and completely into the blood and lymph, and is rapidly excreted.

Sedative Agents.

Once the characteristic symptoms of tetanus have developed, the treatment must be, in part at least, symptomatic and aim to preserve the patients strength and to limit the frequency of the clonic spasms and muscle tetanus which threatn fatal involvement of cardiac and respiratory action. Since the symptoms to be combatted arise from irritation of the spinal nerve cells we naturally have recourse to those drugs which exert a depressive or paralytic action on these cells or drugs which by depression of some part of the reflex arc inhibit the excitatory impulse from reaching the motor ganglia.

The extensive list of drugs employed in the treatment of tetanus is suggestive of the uselessness of many of them. Curare, calabar bean, ergot and morphine are among those mentioned, but heir therapeutic action hardly entitles them to a place among the more rational ones, as choral, the bromides and especially magnesium sulphate.

Bromides.

The important action of the bromides is essentially one of depression of the central nervous system. Not only is the motor cortical area inhibited, but this action extends, to an equal if not greater extent, to the spinal reflexes by blocking the sensory part of the reflex arc. The untoward symptoms as nausea, vomiting and occasionally diarrhoea may be avoided by using dilute solutions and by giving the drug when the stomach is full. The bromides have been used extensively in tetanus probably with benefit, and the administration of large doses is advantageous in aiding to quiet the patient, relieve nervous excitement and produce sleep. The bromides of sodium, potassium, and magnesium have all practically the same action, though sodium bromide is said to have less depressing action on the central nervous system.

Chloral Hydrate.

The use of the anaesthetics, especially chloroform, for the temporary relief of the spasms of tetanus naturally suggested the employment of the soporifics whose similar though milder and more prolonged action lent themselves kindly to the therapy of tetanus.

The action of chloral is essentially one of depression. Being taken up by the nerve cells it inhibits the sensory receptive functions of the brain, renders the cortical motor area less irritable and depresses the spinal reflexes. The vital centers of respiration and circulation are effected late, and the danger of death from these sources reduced to a minimum. The other members of the methane narcotics have in general the same action as chloral. Chloral should be administered in large doses as soon as symptoms appear, and by producing lessened irritability and depressing the spinal cord is a valuable aid in allaying the symptoms of tetanus.

Magnesium Sulphate.

The suggestion for the use of magnesium sulphate in tetanus is due to Meltzer. He

with Auer[26] working on the physiological action of various salts found that potassium, calcium and sodium salts had distinct stimulative properties on certain animal functions, while magnesium salts, on the other hand, possessed depressive or inhibitory attributes. Magnesium sulphate applied locally to a nerve blocked both efferent and afferent stimuli. Subcutaneous injection produced anaesthesia with complete muscular relaxation and abolition of the less important reflexes. Intravenous administration paralyzed the entire body and depressed the medullary centers of respiration and deglutition, but affected the cardiac mechanism but little. Subarachnoid injection was followed by anaesthesia and paralysis of the posterior extremities.

Meltzer,[27] Haubold,[28] Blake[29] and others employed magnesium sulphate subdurally in a number of successful surgical anaesthesias. The untoward effects noted were retention of urine, slight hyperpyrexia and slowing of the respiration.

From studies on experimental tetanus in monkeys, Meltzer and Auer[30] conclude that intraspinal injection of magnesium sulphate will produce complete abolition of all clonic convulsions and tonic spasms, this effect persisting for 24 hours or longer. The body energy is thus conserved and the system protected until the development of antitoxic substances can neutralize free toxin and the metabolic processes of the body can overcome the toxin fixed to the nerve cells.

The subarachnoid administration of magnesium sulphate is a comparatively simple procedure. Under local or general anaesthesia a lumbar puncture is made and a few cubic centimeters of cerebro-spinal fluid withdrawn with a common aspirating syringe. The sterile 25 per cent magnesium sulphate solution is drawn into the syringe and slowly injected. The dosage of the salt is generally stated as one cubic centimeter of a 25 per cent solution for every 25 pounds of body weight. Rather larger doses may probably be used in severe cases without danger. The drug has a cumulative action so that the dosage had best be made smaller for succeeding injections. As Meltzer states that magnesium sulphate is in large part excreted by the kidneys, care must be exercised in its use in the presence of marked kidney lesions.

The chief untoward effects noted as following the injections of magnesium sulphate are bronchorrhoea, depression of respiration, and retention of urine.

Bronchorrhoea and respiratory depression may appear early or not until some hours after the injection. These are probably due to extension of the paralytic action of the salt up the cord and involvement of the medullary centers. Administration of atropine and elevation of the patient's head, as suggested by Logan,[31] will generally check these symptoms, but if they are severe, artificial respiration must be resorted to or as a last resort, the cerebro-spinal fluid may be withdrawn and an equal amount of normal saline substituted as advised by Meltzer.[32]

Retention of urine occurs rather frequently, and necessitates catheterisation if simpler methods fail.

Severe headache and skin eruptions have been noted as following the injections.

Meltzer's[33] demonstration that subcutaneously magnesium sulphate produced complete muscular relaxation has been followed by the hypodermaclytic use of the salt in several cases with uniformly good results. Three cases are reported as cured by the method, and further trial of this most simple means of administration is desirable.

Up to the present time a total of fourteen cases has been reported, as treated with magnesium sulphate, with eight cures, a mortality of 42-43 per cent. Robinson[33] in August, 1907, was able to collect five case reports with two recoveries and reported a sixth case of his own which recovered. Greely[34] reported two successful cases treated with subcutaneous infusion of magnesium sulphate.

Lyon[35] reported a ninth case with cure. Henry[36] reports four cases with one recovery. Miller[37] reports the fourteenth and eighth cured case, and gives an excellent summary of all the reported cases. To this list I wish to add a cured case, the history of which is briefly cited below.

CASE REPORT.

E. K. Male, age 13. Admitted to Gouvernor Hospital, New York City, August 13, 1907.* Family and past history unimportant. On day of admission boy was run over by a wagon and received a lacerated wound on inner side of right knee. Physical examination, patient a strong, healthy boy and examination negative except for wound. On inner aspect of right knee and extending from along the calf of leg for about eight inches is a lacerated wound involving skin and fascia and exposing the muscle beneath. Little hemorrhage. Wound considerably soiled with street dirt. Wound thoroughly cleansed with soap, water and alcohol, freely flushed with bichloride solution and a wet bichloride dressing applied. T., 99°; P., 120; R., 24.

August 14. Wound appears clean. Skin flaps loosely drawn together by interrupted cat gut sutures, rubber tissue drains introduced and copious wet dressing of bichloride applied.

August 16. Wound shows some infection and cat gut sutures have sloughed out. Wound flushed with saline solution and dressed with alum acetate solution. T., 101°; P., 108; R., 22.

August 21. Wound has been dressed daily, looks clean, and is slowly healing. General condition of patient good.

August 22. Complains of slight difficulty in swallowing and stiffness of jaws. Throat is normal. Jaws slightly fixed. Tetanus suspected. Antitoxin 1500 units under skin of right arm. Smears and cultures made from wound (negative). T., 100.2°; P., 116; R., 24.

August 23. Jaws considerably more fixed, and patient has much difficulty in swallowing. Slight rigidity of abdominal muscles. Very slight stiffness of neck. No spasm of extremities. T., 100°; P., 110; R., 22. Antitoxin 1500 units into left arm and later in same day 1500 units into abdominal wall. About midnight patient seemed to be much worse, marked rigidity of neck with retraction, abdominal walls rigid, jaws firmly locked, respiration affected but little. Every few minutes tonic convulsions occur with opisthotonos, spasms of extremities, and rather severe involvement of respiration. Mind clear. Under local anaesthesia (ethyl chloride) spinal puncture made, four C. C. of cerebro-spinal fluid withdrawn and 3 C. C. of 25 per cent sterile magnesium sulphate solution slowly injected (estimated weight of boy, 80 pounds). In about forty-five minutes the convulsions had subsided and the spasm of jaw and abdominal muscles nearly completely disappeared. Partial anaesthesia of lower extremities. Patient went to sleep. T., 100°; P., 110; R., 22.

August 24. 9 A.M. Much improved this A.M. No seizures since spinal injection of last night. Muscular spasm seems to be returning, but boy is able to take fluid and semi-solid food from a spoon. Given a fourth injection of 1500 units of antitoxin into right arm. At 5 P.M. patient seems more restless, and has had one or two slight convulsions. A second spinal injection of 4 C. C. magnesium sulphate into spinal canal produced immediate results, and patient spent a quiet night. T., 100°; P., 110; R., 22.

August 25. Patient improved. Jaws can be freely opened, and there is only slight rigidity of abdominal muscles. Unable to void urine, but after application of hot packs to lower abdomen, passed four ounces. T., 100°; P., 130; R., 22. Antitoxin 1500 units into left arm.

August 26. Patient quiet yesterday. This morning (7 A.M.) had a rather severe convulsion with opisthotonos and marked repairment of respiration. Lumbar puncture at once and 4 C. C. magnesium sulphate solution injected after withdrawing about 5 C. C. spinal fluid. Antitoxin, 1500 units injected into spinal canal following the magnesium sulphate solution. Quieting effect noted in twenty minutes and lasted for about 18 hours. Still unable to void except after use of hot packs. As boy is somewhat restless chloral gr. X. and Sodium Bromide gr. XX. were given per rectum.

August 27. Patient has had no seizures to-day, but is rather restless. Given 1500 units antitoxin subcutaneously. Wound clean and healing. T., 100°; P., 98; R., 24.

August 28. Rested quietly to-day except for one convulsion.

August 29. No convulsions. Slight rigidity of jaw and abdominal muscles persists. Chloral gr. VII and Sodium Bromide in evening.

August 31. Uninterrupted recovery from this date on. A reddish maculo-papular rash appeared on abdomen and arm (Sept. 3), but disappeared in a few days.

September 14. Seems fully recovered from attack of tetanus. Wound of leg healing slowly.

*I wish to thank Dr. J. F. Erdmann, of New York City, for permission to publish this case.

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204 Conti St.

EDITORIAL

TYPHOID FEVER.

Since the discovery by Eberth of the typhoid bacillus and its demonstrated etiological factor in the production of this disease the entire management has changed. Its well known methods of gaining entrance into the human body and means of infecting the water supplies of cities and towns, through the medium of both fecal discharges and urine of patients suffering with it has taught the great lesson of prevention, not only to the profession but to the laymen as well. It can now be predicted that when the people are fully educated in the methods of prevention, taking the sick person as a unit—and destroying all excretions by either submitting the urine and bowel actions to boiling water or a strong antiseptic solution, preferably the first because of its safety and cheapness, typhoid fever can and will be controlled just in proportion to the intelligence and political purity of the powers governing the homes, towns and cities of our country. It is the duty of every physician when called to a case even suspicious of typhoid to isolate the patient as much as possible in a room with as little furnishing as the comfort of the patient will permit, strict attention being paid to the hygiene of the patient as well as surroundings especially submitting the feces and urine to boiling water for at least ten or fifteen minutes before they are disposed of. Permit no exchange of food stuffs or drinking water from that room to other parts of the residence, together with a daily change of the bed linen and clothes of the patient and subject each article to the same process of disinfection, especially warning the nurse that in her toilet of the patient great care must be used to disinfect her hands so that the infection is limited to the one case and not as heretofore carelessly permitted to become distributed so that others in the household or neighborhood may become infected through the medium of contamination of water supplies or food stuffs.

It is not utopian to predict that when doctors intelligently enforce the above rules and the people thoroughly co-operate with them in their efforts to protect, that this, the greatest and most widely distributed infectious fever will be curtailed to the minimum in its distribution. While, of course, we must take into consideration the welfare of the patient, and manage his case within the border lines of safety, we must look to the larger and more important problem, namely, the protection of the well. All infections are more or less local at first, and proper effort in correct and scientific lines of disinfection and prevention can and will stop their distribution with that case when properly carried out. Towns and cities must advance with the progress of preventive medicine to the extent that all water supplies and uncooked food stuffs are subjected to a thorough investigation with sufficient frequency to prevent endemic or epidemic diseases from spreading. When our people as a nation realize that the health of her citizens is largely the index of her commercial and agricultural prosperity and pass laws of health and see to their enforcement, then, and not until then, will the wonderful progress of medicine be felt and the doctor become what he should be, the true guardian of the health of his people. The fact that both political parties placed in their platforms in the last presidential election a clause certifying their willingness to give representation in the National Government Board of Health Authorities is an omen of great good and promises in the near future an awakening along lines of preventing disease which must redound the everlasting credit and untiring efforts of the medical profession. To impress this lesson and enforce these laws every doc-

tor must become a missionary, as it were, and instructor, taking the home as a unit, thus enlightening the people that they may co-operate in this life-saving, progressive age, and by the enforcement of rules laid down by the doctor for their own protection in the home and the laws recommended by the Boards of Health to municipalities and National Boards of Health until with one singleness of purpose and grand movement all infectious diseases shall have been driven from the face of the earth. Then and not until then will the medical profession come into its own and take their place as truly the benefactors of the race.

THE HOUSE FLY.

This common creature is now attracting the attention of the world. He is in line with the flea and the mosquito. Up to within a few years ago flies were considered only as an uncleanly nuisance, now they are regarded as death-dealing demons. It is strange indeed that the world should have to wait until the twentieth century to really become acquainted with the dangers of the fly—the companion of civilization.

Let's see what there is in the subject—First, How the fly comes into existence; second, what it does; third, how its existence may be prevented.

A parent fly usually deposits about 120 or 140 ova in horse manure preferably, but other waste material will serve. The ova hatch into maggots in about eight days; the maggots mature in a few days and form the pupa stage from which the full grown fly develops in five or seven days. So the adult fly is grown from the egg in about ten or twelve days. During the breeding period the maggot lives upon the filthiest and foulest of material things, and never through life does the fly forget his early association.

What are his habits and inclinations after birth? It seems that his greatest ambition is to satisfy his hunger and varied tastes. He seldom seeks the beautiful, but often passes from the sublime to the ridiculous, for from the very day he peeps from the little brown pupa he flits unceremoniously from the foulest smelling rat or fecal matter to the daintiest foods on the table, in the kitchen or on the fruit stand. Often he baths his face in the fresh sputum from a tuberculous patient preparatory for breakfast at the nearest lunch counter or restaurant. During the heat of the day he retires to the cool privy vaults in the back yard and returns later to the house for a sup of tea and a bed on the ceiling or chandelier. The next morning at the break of day he falls upon the neck or nose of some weary sleeper, and waltzes about over his face; or he may play about the lips of the infant in the cradle. All of this he does in innocence and in pursuit of happiness.

But let's see further what this demon gathers and carries with him and scatters along his trail in all these wanderings. From the privy vault he gathers the typhoid bacilli on his feet and proboscis and there is but little doubt about him taking the bacilli into his own body and then after several days passing them out in his specks as living virulent germs. It has positively been demonstrated that he can take the bacilli through himself and excrete them alive. It has also been demonstrated that flies taken from the fence in the vicinity of open vaults into which excreta from typhoid patients had been thrown, would inoculate a tube with typhoid bacilli. How easy it is for the drying milk cans, the table dishes, knives and forks, and food itself, to become infected with typhoid bacilli. The germs of summer diarrhoea are unquestionably carried by the fly to the lips, bottle nipple and playthings of the infant.

When the fly walks over the lips of a baby or crosses the loaf of bread, he leaves germs along his path just as a man will leave mud on a carpet.

There is a notable relation between flies and summer diarrhoea that has not been observed in any other disease, and that is in New York

City and in other cities it has been found that when flies are most numerous summer diarrhoea cases are also most numerous, and this occurs in New York in August. In Baltimore it is a little earlier. These are facts, but there may be other explanations.

No one knowingly would allow a mosquito laden with yellow fever germs to bite him, nor would he allow a flea from a plague infested rat to test his blood. The fly is equally dangerous.

How shall this question be dealt with in a practical manner? The first thing to receive attention is the horse manure. It should at once be removed from the stable and placed in fly-tight receptacles—boxes with doors or lids, and from these the manure should be removed twice a week during the months from May to October. Manure cannot be practically disinfected with kerosene oil.

Garbage cans should be kept closed and clean. No vegetable or animal waste should ever be thrown about the yard. Dead animals of every kind should be buried or disposed of in some other suitable way. It should be a felony for a dead cat, rat, or dog to be thrown into the street or alley. The greater portion of the waste from the domestic kitchen should be burned in the stove. All places where food is prepared and eaten, even fruit stands, should be screened. Places not screened should not be patronized. All patients with contagious or infectious diesases should be screened.

All the details cannot be given. The question is a new one, and must be studied and dealt with in a manly way by physicians, health officials and laymen. J. M. K.

BOOKS

BOOKS RECEIVED.

Lectures on Hysteria. By Thomas Dixon Savill, M.D., Lonon. Physician to West End Hospital for Diseases of the Nervous System. 262 pages, illustrated. Price, $2.50 net. Wm. Wood & Co., Publishers, New York, N. Y.

The Malarial Fever, Hemoglobinuric Fever and the Blood Protozoa of Man. By Charles F. Craig, M.D., Late Pathologist and Bacteriologist of the Sternburg, U. S. Army General Hospital, Chickamauga Park, Ga. Attending Surgeon, New York. 477 pages, illustrated. Price, $4.50 net. Wm. Wood & Co., New York, N. Y., Publishers.

BOOK REVIEWED.

Principles and Practice of Physical Diagnosis. By Jno. C. DaCosta, Jr., M.D., with 212 original illustrations. W. B. Saunders & Co.

One of the most valuable books that has recently come to this office, is this volume from the Saunders Company. It is an exhaustive treatise on diagnosis from an author whose literary efforts seem to reach their highest attainments in this book.

It is well written, splendidly illustrated, logical in its findings, and a necessary addition to the library of a modern practitioner.

G. C. T.

ABSTRACTS OF CURRENT LITERATURE

MEDICINE.

MEDICAL EDUCATION IDEALS.

W. W. Keen, Philadelphia, (*Journal A. M. A.*, June 26), in an address before the students of the medical departments of the University of Nebraska at its latest commencement points out what are or should be the ideals of the medical student in preparing for his life work. First, he speaks of the ideal in acquisition which should include to a proper extent the acquirement of financial success; but, with this, he gives a special warning against the sin of covetousness. Besides money, we must acquire knowledge, and he speaks of the importance of a general education to the medical practitioner. Keen would have the doctor be conversant with the college requirements in both the ancient and modern languages. He should have a liberal education before beginning his professional studies. The teachers in the higher schools can give but a mere beginning, but they can show the methods by which the student can obtain knowledge. Second, they can inoculate their students with the enthusiasm for their profession, with the ideal of achievement. The medical graduate should not be content with acquiring existing knowledge, but should work to add to it by his own researches. Not everyone can be a great discoverer, but all who earnestly endeavor can add a little to the sum of our knowledge. The third ideal to be realized is the ideal of service and he pleads for erection and endowment of laboratories of research where work can be carried on that will be of benefit to humanity in general. The fourth ideal which the twentieth century demands is the ideal of character; all else may be won, but if one fails in this, the other attainments are only apples of Sodom, turning to ashes at the slightest touch. The heroes of our people are not the great material organizers for the acquisition of wealth, but the high and lofty characters. The medical profession gives the highest opportunities for approaching this ideal. It stands pre-eminently for the ideal of character.

ACUTE PANCREATITIS.

Following a report of a case of acute pancreatitis, W. F. Cheney, San Francisco (*Journal A. M. A.*, June 5), discusses certain questions it suggests. First, how frequent is the disease? To this one can answer it is certainly not rare, although it seems to have gone undiscovered for many years, like appendicitis and cholecystiis. Since first recognized, cases have multiplied, and no doubt, as time goes on, it will be found that it is still commoner than we at present suppose. The question as to its etiology can be answered in one word—infection. This may occur from the intestine or from the gall bladder or by direct extension of a duodenitis through the wall of the duodenum or by infected emboli carried by the blood streams from distant parts. Most cases have been found associated with gall-bladder disease, the next largest number with gastroduodenitis, especially that due to alcohol. Those cases reported as secondary to general or local infections are best explained by transmission of the infection by the blood. The clinical recognition of the disease as shown by all the published reports is made by the sudden violent onset with pain, vomiting, intense tenderness of the upper abdomen, collapse, hiccough, and, later, the symptoms of localized peritonitis with low fever and irregular chills. The laboratory evidence is not diagnostic. There is quickly a high leucocyte count with an increase of polymorphonuclears. The urine rarely shows sugar at first. The absence of indican is an important point in differential diagnosis, and we may have the Cammidge reaction. Taking all the facts, however, there is no absolutely certain way of clinically recognizing pancreatitis. There is no medical treatment for the condition. It demands surgical treatment unless the shock should be consid-

ered too risky. Morphin for pain and stimulants to tide over the crisis of imminent collapse may be used in the beginning of the symptoms. While there is no certain diagnosis possible, we can promptly arrive at a conclusion limiting the diagnosis to a few conditions, all of which require operation, and the only question really remaining is how soon to operate. Osler gives the mortality of unoperated cases as 90 per cent, while of patients operated on more than 50 per cent recovered.

WHOOPING COUGH.

C. R. Grandy, Norfolk, Virginia (*Journal A. M. A.*, June 26), remarks on the slight importance attributed by the laity to whooping cough and its partial justification by the attitude of the profession toward that disease. He quotes the statistics, showing that it is really a very serious matter in children under five years of age, being indeed more fatal than scarlet fever. It does not help the matter to attribute deaths to bronchial pneumonia or other purely secondary complications. As Forchheimer says, "In few diseases can so much be done by prophylaxis; in few is so little done." There are difficulties, however. In older children it does not seem a very serious disease. They do not feel very ill, and want to be out doors, and the air and exercise are good for them. Moreover, the disease is infectious from its very onset, and, while the children themselves are kept from school, their brothers and sisters are allowed to continue their studies through the possibly most infectious catarrhal stage, and are almost sure to infect schoolmates with infant brothers and sisters at home. Grandy thinks that the first step in prevention will be to teach the public, by a campaign of education, the true seriousness of the disease. The first actual step with the individual case should be prompt notification to the health department. The house should be placarded and the family instructed how to prevent the spread of the disease. If the children are allowed to go in the parks they should wear a conspicuous badge labeled whooping cough and the privilege of going in the public parks be withdrawn if they insist on associating with other children. A better place would be a public hospital outside of town where such children should be sent. Any pupil in the school who has been exposed should be immediately sent home by the teacher who should also notify the health officers, and placard and quarantine should not be withdrawn until six weeks from the onset have elapsed and the whooping and expectoration have ceased. Disinfection should follow. Prompt diagnosis will still be a difficulty, but as soon as whooping cough has appeared in a town, physicians should be warned that a dry cough without chest signs, little or no fever, and a lymphocytosis is sufficient for a diagnosis, and such an early diagnosis may be enough to stop a considerable epidemic.

EYE, EAR, NOSE.

OPHTHALMOLOGY AND GENERAL PRACTICE.

A. A. Hubbell, Buffalo, New York (*Journal A. M. A.*, June 26), in his chairman's address before the Section on Ophthalmology of the American Medical Association, after first noticing some features of the program, speaks of the insufficient attention given to ophthalmology in medical schools and the too limited qualifications of the general practitioner in this line. Too many physicians are inclined to dismiss eye cases, and the result is the encroachment of the still more unqualified commercial "optometrist." There is some complaint also to be made of the professed ophthalmologist who too often begins his work as a specialist with a too superficial knowledge of the subject and without experience in genthalmology from general practice too exclusively, is also a harmful factor as is also the lack of any legal qualifications beyond that of the general practitioner for any specialty. As to the remedy, Hubbell says that we can first

strive to disabuse the public, the profession at large, and the medical school authorities that opthalmology is so suited to exclusive study and so separate from other departments of medicine that it should be set off by itself and made only a voluntary subject for study and practice. It is not difficult to comprehend, and the diseases of the eye are the last that should be excluded from the physician's practice, as they are to be found everywhere, and with an ordinary knowledge of the subject, the general practitioner can do very much good and render to his patients the assistance they are entitled to expect. Accompanying a change in public and professional sentiment in this way there should be a corresponding change in medical teaching which will enable the general practitioner to acquire a sufficient amount of ophthalmic knowledge to meet his future needs as a family physician. The subject should not be a voluntary one in his medical course and it should be sufficiently taught to qualify the graduate to treat all ordinary and infectious diseases of the eye, to distinguish between mild and severe ones, to treat injuries of the eye which are superficial and uncomplicated, and to examine for refraction errors and correct at least the simple forms. He would add also a supplementary examination by the state board covering these points, the successful passing of which would be one of the conditions for license to practice. This would be a check to any neglect on the part of medical schools. It is unfortunate that no qualifications for practice have heretofore been required of the ophthalmologist other than those of the general practitioner. The absence of these and the presence of a dominant spirit of commercialism have, on the other hand, caused in many cases too much haste in beginning this special practice after finishing undergraduate work, with perhaps a few weeks in postgraduate studies. Ophthalmologists are increasing in number and the unqualified ones are also increasing in number. In order that protection may be secured against unqualified ophthalmologists he suggests that the course and subjects of study shall be regulated by law, and that special boards of examiners should be appointed to determine his fitness for practice and authorize a license in this specialty. But the qualifications that it should demand are extended and thorough postgraduate study of every new subject bearing on ophthalmology, personal experimental study in the laboratory, and personal clinical work in a hospital or in his preceptor's private office. He offers these propositions to the section, and, if accepted, recommends the appointment of two committees, one to determine the amount of qualifications to be demanded of the general practitioner, and the other to determine and secure the necesary changes and the qualifications of the ophthalmologist specialist.

THE FAUCIAL TONSILS AND THE TEETH.

G. Hudson-Makuen, Chester, Pa. (*Journal A. M. A.*, June 19), emphasizes the importance of the faucial tonsils from the dentist's standpoint. Diseased faucial tonsils affect the teeth in three ways: First, by impairing the general nutrition; second, by contributing very largely to the local invasion of the teeth by the numerous bacteria that infest their crypts; and third, by their pressure, they interfere with the alignment of the teeth and with the normal development of the maxillary bones. That diseased tonsils affect the general health has been proved beyond the shadow of a doubt and the teeth suffer with it, as well as directly by contact with its filthy catarrhal secretion. The third manner in which the teeth are affected by hypertrophied tonsils has, so far as Makuen is aware, not been mentioned in the literature, but he considers it of no little importance. These glands are sometimes very large and dense, and their constant pressure on the surrounding structures may cause changes that will seriously embarrass the normal circulation and respiration, produce neuralgias, etc., as well as interfering with the

normal development and arrangement of the teeth. The indirect effect of diseased and hypertrophied tonsils on the teeth and their settings through forced mouth-breathing, has been described fully by numerous observers. Makuen pleads, therefore, for the eradication of all glandular obstructions to the normal development of the teeth and alveolar arches, prior to any attempt to remedy the structural defects of these organs. He thus sums up his conclusions. The faucial tonsils and the teeth are in close approximation and they are alike subject to disease or degeneration. Diseased tonsils and teeth are locally and systematically unhygienic. Secretions from the tonsils may infect the teeth, and, contrariwise, the tonsils may be infected by the teeth. Diseased tonsils and teeth cause headche, earache and facial neuralgia, and they become a direct source of infection to the glands of the neck and, through the efferent lymphatics, to the general respiratory and circulatory systems. Hypertrophied facuial tonsils often become so large as to affect the ear, the circulation of blood, the nerve supply of the face and head, and the normal development of the alveolar arches. The teeth serve important purposes, but the exact function of the tonsil has not yet been demonstrated. The importance of preserving the teeth has been fully recognized, but the diseased tonsil is not worth preserving, for it has lost its usefulness and become a menace to the human economy. The only rational remedy for diseased tonsils is total extirpation.

Ocular Disturbances During Pregnancy. By Adolph O. Pfingst, American Practitioner and News, July, 1909.

The functional disturbances met with during pregnancy which are believed to have little significance are briefly referred to by the author.

The organic troubles, with the exception of detachment of the retina which is sometimes seen in the latter months of gestation, are all secondary to pathological changes occurring in the kidneys and are not uncommon.

The frequency of albuminuria during pregnancy has been variously placed from 6 to 40 per cent, the proportion of cases in which the eye is involved depending upon the cause of the albuminuria.

In the case of pregnancy kidney which is the most common cause of albuminuria, the ocular disturbance met with usually occurs late, blindness coming on suddenly. It is a toxic amblyopia and not due to retinal changes.

The prognosis in these cases is good as far as the eyes are concerned, the vision returning rapidly after removal of the cause of the uremia.

The other cause of albuminuria of pregnancy is the chronic nephritis, the acute form of kidney inflammation being present very infrequently. About 8 per cent of the cases of true nephritis are complicated with involvement of the retina. These cases cause disturbance of vision earlier than the toxic cases, and the disturbed function comes on more insiduously.

Characteristic changes are recognized in the retina with the aid of the ophthalmoscope, both eyes usually being affected, though not necessarily in the same degree.

While the occurrence of retinitis during Bright's disease is always a grave complication, signifying an advanced state of the disease, the diagnosis for life in Bright's retina of pregnancy is better than in other cases, many women living for years after having had marked retinal changes. With reference to visual acuity the prognosis is not altogether bad, but increases with the amount of retinal involvement and with the duration of the disease.

In considering the advisability of the premature induction of labor Pfiingst takes the stand that in the cases where the ophthalmoscope shows no retinal changes the obstetrician should decide the question, and those cases showing retinal changes and disturbed function, unless very late in the pregnancy, the oculist should recommend the immediate induction of labor.

PUBLISHERS' DEPARTMENT

THE MODERN TREATMENT OF HAY FEVER.

Whatever be the accepted views as to the pathology and etiology of hay fever, there is little difference of opinion concerning its importance and the severity of its symptoms. An agent that is capable of controlling the catarrhal inflammation, allaying the violent paroxysms of sneezing and the abundant lacrimation, cutting short the asthmatic attack when it becomes a part of the clinical ensemble, and, finally, sustaining the heart and thus preventing the great depression that usually accompanies or follows the attack—in short, an agent that is capable of meeting the principal indications—must prove invaluable in the treatment of this by no maens tractable disease.

In the opinion of many physicians, the most serviceable agent is Adrenalin. While not a specific in the strict meaning of the word, Adrenalin meets the condition very effectually and secures for the patient a positive degree of comfort. It controls catarrhal inflammations as perhaps no other astringent can. It allays violent paroxysms of sneezing and profuse lacrimation by blanching the turbinal tissues and soothing the irritation of the nasal mucosa which gives rise to those symptoms. It reduces the severity of the asthmatic seizure, in many instances affording complete and lasting relief.

There are four forms in which Adrenalin is very successfully used in the treatment of hay fever: Solution Adrenalin Chloride, Adrenalin Inhalent, Adrenalin Ointment, and Adrenalin and Chloretone Ointment. The solution, first mentioned, should be diluted with four to ten times its volume of physiological salt solution and sprayed into the nares and pharynx. The inhalant is used in the same manner, except that it requires no dilution. The ointments are supplied in collapsible tubes with elongated nozzles, which render administration very simple and easy.

It is perhaps pertinent to mention in this connection that Messrs. Parke, Davis & Co. have issued a very useful booklet on the subject of hay fever, containing practical chapters on the disease, indications for treatment, preventive measures, etc. Physicians will do well to write for this pamphlet, addressing the company at its home offices in Detroit or any of its numerous branches.

CONSOLIDATION OF THE MEDICAL DEPARTMENTS OF THE UNIVERSITY OF NASHVILLE AND THE UNIVERSITY OF TENNESSEE.

The union of two of the oldest universities in the Southwest in support of a joint medical college is the most important recent event in southern medical education. After more than a century of brilliant achievements in the cause of higher education in the South, these two state institutions have combined their medical faculties, laboratory and hospital equipment and strong financial backing in the formation of one powerful medical college with standard entrance requirements and curriculum. This institution is one of the few in the South not entirely dependent upon receipts from tuition. Many thousands of dollars for increased laboratory equipment have been placed at the immediate disposal of the several departments. The purpose to provide the best fundamental instruction has been fulfilled by the employment of thoroughly scientific laboratory men who will be amply compensated for their service.

The adoption of higher preliminary requirements has become feasible as the result of the great increase in the number of standard high schools throughout the South during the past two years. The University of Tennessee, one of the parties to this union of strength, has by recent act of the Legislature become the head of the public school system of the state. Within a comparatively short time every county in Tennessee will have a fourteen unit high

school whose graduates may receive free tuition in the University with traveling expenses paid by the State, so as to make it equally accessible to students from every county. Students intending to study medicine may so elect their course as to attend the Literary Department at Knoxville three years and apply for their A.B. or B.S. degree at the end of their first year in medicine at Nashville, and after three more years in the medical department receive their M.D. degree. The agreement of combination between the two universities anticipates that a similar arrangement will be made by the University of Nashville. Thus the combined degree, A.B., M.D., or B.S., M.D., becomes possible after seven years of study, three in the literary and four in the medical.

Practically all of the instruction with the exception of the clinical will be given in the building formerly occupied by the Medical Department of the University of Nashville. The greater part of the senior work will be given in the college hospital on Broadway in the building formerly used by the University of Tennessee as its Medical Department. This large four-story building already possessing an amphitheater of remarkable suitability for observance of clinical operations by students is being remodeled and thoroughly equipped to accommodate sixty or seventy beds, and will be in operation by the first day of September. Although ample provision will be made for charity patients, particularly desirable accommodation is provided for those able to pay. The equipment will be first-class and worthy to be installed in the large six-story hospital to be erected on the old medical colege site, which is part of the original grant from North Carolina in 1785. This spot is dear to the he arts of thousands of alumni who studied under Lindsley, the elder Eve, Bowling, T. L. Maddin, W. T. Briggs and others of equal fame when there were few schools west of the Alleghenies.

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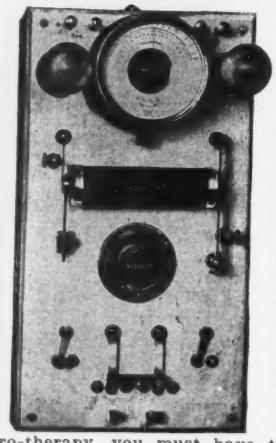
The faradic coil designed to deliver a large current volume from either primary or secondary (this being necessary to obtain results), and having the core made of the finest annealed Norway iron wire, same as is used in x-ray coils, the secondary being a large winding of low resistance, will therefore deliver its current at a greater potential than the coils usually used for this work. It must be equipped with pendulum vibrator with sliding weight for varying the number of interruptions. Also a so-called ribbon vibrator, employing a thin steel ribbon under high tension is also to be included in the equipment. The faradic current must be controlled from the same rheostat, so as to avoid confusion, and one switch for the two vibrations and for the galvanic or primary and secondary galvanic should complete the equipment. The W. M. Wall plate No. 5 fills these specifications admirably and can be obtained in open face or closed case with beveled glass door. It is a most attractive apparatus, compact and just the thing for the busy practitioner. A rectifier will allow the use of the alternating current, doing away with the cells. The price is very reasonable for a first-class wall plate, being thirty dollars for the cased type.



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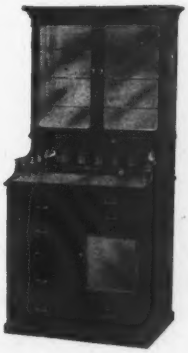

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NOTICE.

TO THE MEDICAL PROFESSION:

On this page we wish to send another message to the profession of the South. It is the one great desire and object of this journal to render to the profession of the South as much valuable service as it possibly can. The way to accomplish this is through original articles, reports of cases and abstracts.

We wish to emphasize the fact with reference to original articles that the Journal will spare no means on its part in order to present in the very best condition to the profession any article it may publish. It will cheerfully prepare plates of illustrations, and really, we urge writers to illustrate their articles by photographs or drawings. We believe that illustration clears up the subject matter and renders it of greater value. We urge our Southern writers to send their work to this Journal, and we will see that the printer's part and the distribution are properly done.

Another valuable educational point is the report of selected cases. Some valuable and useful information may be given to the young and old practitioner by well prepared reports of selected cases.

We, therefore, request the profession, especially those interested in improving the practice of medicine, to send the Journal original articles on subjects of their own choice and also reports of cases which contain an element of instruction. A wide support of this kind from the entire profession of the South will insure the continued publication of a journal which will, for that reason, be of the greatest help to every practitioner in this section of the country.

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